(6)

Lecture 2d (Nashville) 21/March/65.

Comparative Loss
Use of Shell
Post Mortem

Velocity of a Ball varies.

Initial velocity of Elongated Rifle ball about 1000 ft. pr. Second

Remaining velocity.

Terminal. Velocity. (To Arming of U.S. Army)

Having studied briefly nature of projectiles, we are now prepared to study the character of the wounds they produce — Apology for teaching what all know Systematically

Genus of Wounds. 1st From the Projectile itself, or Effects of Projectile may be combined with 2d A foreign Substance. (a). Clothing, cap. Pants.

(b). Accoutrements Eg. belt, canteen, musket, wire, &c. &c.

(C) External Objects, E.g. Gravel, Stones, Shingles, Hancock's case (Ballot Splinter hail money.

(d) Portions of human body, attached case of comrade, in the jaw — molar tooth in eye — antietam case, of molar in Head of humerus —

(e). From particles of powder.

Possible Events attending Wound of human body by projectile from Small Arm.

I. A Ball may Enter & lodge without fracture of bone.

II " " " " " & Emerge " " " " ".

III " " " " " & lodge with " " " ".

IV " " " " " & Emerge " " " " "

V. " " " " by one opening; divide one or bones, with or without fracture, & Emerge by one or more Openings.

VI OR. Having divided, with or without fracture, one or more portions may lodge; and one or more portions Emerge by single or multiple Exit-wounds.

VII. A Ball striking External substances, may divide, & fragments Enter body by different Openings, producing varied Effects. Stone wall. fence, or musket &c.

VIII. A Ball Entering, with or without fracture of bones, may Emerge by Natural passages, as the mouth, or anus, or be discharged through fistulæ. Slutzer's lung case — Smith's Cloud case Lung

IX. A Ball may Emerge at wound of Entrance

X. A Ball may Explode in the body. forearm case

XI. A Ball may graze or plough, or produce Selon wound.

XII. A Ball may contuse. XIII. A Ball may pack in Cloth, make Wd of Entrance & Orifice without perforating cloth

Changes in Shape of Ball. Innumerable, may be Splat, regular,
or irregular by bend &c or flattened, or truncated, or flattened
at base — Explain Ricochet Segments of Sphere, Explain this
Mushroom peculiarity — &c

Projectiles - charges for -
Sighting Compensation
Rifling - Bullets - ~~Shot + Buckshot~~ - balls & shells.

Internal properties -
Flight, laws of
Point Blank - Trajectory &c

6½

Arming of the U. S. Army during war 1861—

1. Three months men armed with Old Smooth bore musket, of 1822 (cal. 69) altered to percussion lock, & Old Smooth bore of 1842, which was new percussion lock. Some of the N.Y.S. Militia might have the Springfield Rifle of 1855, obtained from the State Quota. Regular Infy: all had the Springfd. Rifle of 1855.

2. First 500,000 Levy. 25,000 had Springfd. Rd. Musket, which was all that could be got in that year — ~~Bands~~ of From these the Regr. Regts. in the West were supplied, and all the rest of them imprvd army were distributed to A. of Potomac. The ~~rest~~ remainder of the Army had Smooth bore arms of which about 125,000 were of inferior foreign make, the balance American — At Shiloh probably ¼ of troops had Smooth arms.

The objection to the Smooth Musket, gun, which was altered to percussion & then rifled, was its large calibre .69, & heavy ball. The men could not carry sufficient ammunition. The preferred calibre was .58, & next .50 Engl. St. calibre .577, as so many of these guns are used, we reduced our ball to .54 Effective Range of imprvd 2d Sp. Musket, about 700 yds. the limit of ordinary vision, but will kill at from 1000 to 1200

Now the Eng. projectile is almost entirely used.

Cavalry. In Early part of war, Sabre, & Revolver, Subsequently Sharp's Carbines as fast as they could be made— Rule ~~this~~ year, only Sabre & one fire arm, the arm now being rapidly introduced is the Spencer, & some Henry Repeating Rifles —

Batteries. first- Smooth bore- then all rifled- now mixed.

Now Consider phenomena of Entrance of Ball; of its Exit; of its course & doings; of its lodgement; & Effects of Spent balls.

These are influenced by Size & material, but especially, by Shape and Velocity of Ball. Examine facts relating to.

Entrance & Exit Wounds.

Discussion concerning. Old views as to inversion, & Eversion, Theory of, being from rarer to denser medium, & reverse —

Character of Entrance Wound of round ball (small bore) at moderate range, is round, slightly larger than ball, inverted, contused Edges,

Exit Wound of Same ball, larger, & more irregular.

" of Round ball from Rifle, apt to be in resisting tissues more cleanly cut, & sharply round —

" of Round ball from a Colts pistol, punched like orifice.

Elongated Rifle Ball. ~~Wound~~ Character of Entrance Wound depends somewhat upon how the Ball Strikes, whether point foremost, & at right angles to surface, or at an angle, or laterally.

In first case, crucial, Star Shaped, a triangular & irregular, wound not necessarily larger than diameter of ball. Sometimes larger in Cheracic wounds. Probably influenced by Velocity of ball, & its respect rotation on its long axis.

Oval wound where the Elongated ball on a Glancing surface, or at an angle.

Linear wound may occur over a bone, or in tense or hard tissues, where a ball is ~~flying too~~ rotating very rapidly in its own axes — Resemblance to wound from "Worm Blanche"

Wound of Exit, from Elong. rifle Ball still more irregular than wound of Entrance — May be greatly increased by fragments of bone, &c: or the ball may be deflected in its course.

The above remarks as to wound of Entrance & Exit, only apply to the perfect ball, if the ball is mutilated or deformed, or Strikes a foreign substance or Ricochets, the wound may vary — Describe appearances.

Course of Balls. On general supposition straight. Deflection of Round ball, & Conical ones. Cause, glancing on bone, or hard tissues perhaps Spasmodic action of muscles. Apparent deflections caused by Change in position of Soldier.

Track of Elongated Ball, large and irregular, with great destruction of tissues. Separation of Subcutaneous cellular tissue, around wound of Entrance.

Effect of this Ball on

Bone. Shattering, Comminution, perforation, with or without fissure. Fissure does not often occur especially in young bones the ring between the Shaft & Epiphysis.

Elasticity of Skin, may prevent Exit of ball, which may rest under Skin.

Muscle. Great destruction. Subsequent Atrophy.

Nerve. Vein. Arteries, Escape of the latter in round ball wounds, not so often from the Elongated Ball.

Lodging of Balls.

Generally at low velocity. Not only confined to round balls. Elongated balls frequently also. Larger missiles as round Shot. 12 pdr. Shell case, & fragments of Shell. Foreign Substances may lodge, alone or combined with Balls.

Cysts, in Soft parts. Musket ball in back. in neck. in great Omentum. Castaing's case Ball in thoracic parietes, & in hip. These are Exceptional cases, they generally give rise to irritation, inflam^{n}

and Suppuration – long sinuses may result, as from presence of clothing.
Lodged in bone to Osteo-Myelitis, Caries, necrosis, Excessive Deposit of bone – Suppuration – gangrene, & to Pyæmia – In Skull cavity to Epilepsy &c. In all cases to be Extracted –
Nelaton probe – forceps &c.

Hemorrhage. Not so rare, nor so common.
on Battle field Previous steps – Arterial, according to Size of vessel.
Round ball may brush artery – Elongated ball – Shell injuries.
Examination of dead on battle field, male, wounded in Head, or from internal hemorrhage in thoracic or abdominal cavity.

Nashville
lectures
also used in part in
Jefferson College Medical lectures
1871

Lect. 1st 1. Nash. 1865

Mr. Presd.t & Members of the Military Medico Chirurgical Society of Nashville.

"

I appear before you to night, in response to the very flattering invitation, which has been recently tendered me by this Society; and with the purpose of Entering upon a brief Series of discourses, concerning Certain topics of Surgery, in which You and I are alike interested.

In Selecting a subject, the Examination of which might occupy us, I trust profitably for a few Evenings, I have Experienced but little difficulty.

The theme for our Studies is a fertile one, and is Suggested by our daily Observ-ations.

In never in the history of Military Medicine have such facilities been offered for profes-Sional improvement, and for the advancement of our Craft, as those which we now Enjoy.

It behooves us then diligently to glean, and carefully to garner, those precious Experiences which how so luxuriantly Spring from the Rank Soil of the Crimsoned fields, over which our pathways lead.

For Gentlemen, it is only

upon the field of battle, or in the great Military Hospitals, with its thousands inmates, that the Student of Surgery of War, should seek his School.

Quaintly, yet forcibly was it said by that Apostle of Our Art, Good Old Ambrose Paré, that

"For the Chirurgeon, the testimony of the Ever-faithful Eyes, and Senses, Availeth more, than the constant Reading of books, or the daily Teaching of Teachers"

As it was, when Paré wrote, three hundred years ago, so is it now. The Experience of one campaign does, in truth, avail more than all the Dusty Volumes of the past.

Viewed then from this Stand point of practical Experience, and daily and Repeated Observations, ample indeed have been the Opportunities of our Army Surgeons; and nicely should their records Speak.

Let us then, Gentlemen, Endeavour, So to profit from our Lessons of the present, that hereafter, professional Generations may turn to our work, as we in our own day, look back upon the Labors of Vesalius, and of

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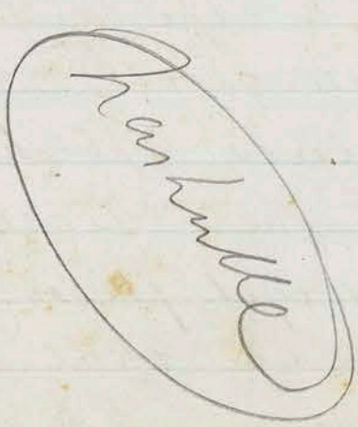


Flight of Balls.

Deviation influenced by.

1. Faulty Construction of arm. { Irregular Calibre, Windage, Hardness of Trigger
2. " " " Charge. { Bad powder, Improper quantity of
3. " " Projectile { Deformed ball, Centre of gravity wrongly placed
4. + By Gravity
5. + " Atmospheric resistance

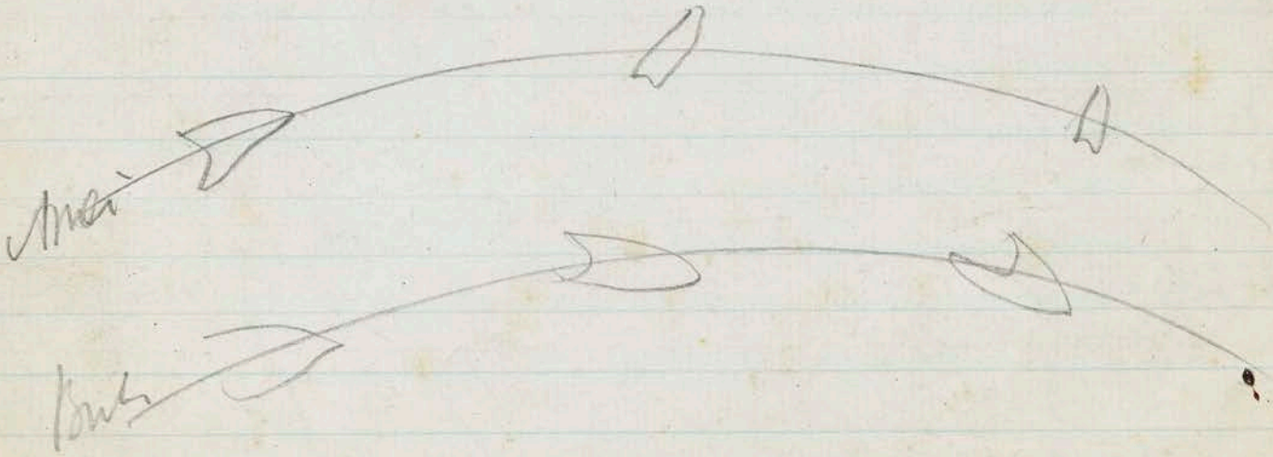
Here Three Unit -
1. Line of ~~fire~~ Sight
2. ~~Trajectory~~ Line of ~~Sight~~ fire.
3. Trajectory

Point Blank { 1. When line of sight cuts trajectory in 2 places. 2. When ball clears superior and horizontal object

Varying velocity of Ball
Initial velocity of a ball, about 1000 ft. for Elong.d Ball
Remaining velocity 1400 ft per second
Terminal velocity. - Not like Nature of Elongated ball at this time

Position of ball, in relation to trajectory, influenced by Centre of gravity of ball,
When a ball is discharged two movements - 1. of Translation
2. of Rotation -

Deviation of balls. Collapse of bore



The war of the Great Amer.n Rebel.n has been one of unparalleled bloodshed accompanied with an unparalleled bloodshed of an unusually bloody character. The Carnage in battle, since the war began, has been out of all proportion, to the number of troops Engaged. Compared with the European battles of the latter part of the last century & the early part of the present one, & greatly Exceed those occurring in the battles, of the latter the rate of loss in 60 years ago the last century, & the first half of the present century — That there has really been no exaggeration A comparison of these actions of past days, and of those of this Rebellion, in which about the same force has been Engaged, with substantiate this Statement — Thus for Eylau at Wagram & Deutsch Brod, the whole number of Both Armies Amounted to about 300, casualty to about 60,000 men lost in all about 300 wounded — at Austerlitz the loss on the part of the a.f. troops was in the neighborhood of 15,000 K & W.d, the force Engaged being about the same as at the great battle in Belgium called — at Shiloh, the loss of the Gov.t troops Amounted to about 11,000 in K. & W.d at Murfreesboro about the same, at Chancellorsville to about 15,000 at Gettysburg to 18,000 at Chickamauga to 15,000, & in the famous March through the wilderness, in the summer of 1864, to the loss from the Rapidan to the James, not less than 60,000 men — The loss of the Southern armies will be found correspondingly great as one of these close battles Against Force Conflicts when Engagements men, Skilled in this nature, & at all Events the command of the the Worsted party attacking remained on the Field, — the figures of the Confederate Loss of which the higher report, although imperfect are the most reliable of all the Rebel Correspondence of the Gen.l Lines of Fight; — To what is the Largeness nature of these Losses in actions chiefly due? — The Answer turns all Considerations of modern to the improved character of the Arms & projectiles employed by the Contending Forces, And to the increased Range & Velocity of the projectile, both for Small Arms & artillery. Not only have the Casualties in battle a Brief Study of the Arms & projectiles been greatly increased in number by the introduction of the new arms & projectiles, but the gravity of the Casualty must has been greatly augmented —

A brief Study Account of the latter Items of the new arms & projectiles will be found, to be by no means out of place, in the opening Chapter of any description of the wound to be produced in modern Warfare; the more Indeed, as the Author has observed that a certain degree of ignorance exists on this subject, has been manifested even among those Medical Officers who have had large & valuable Experience in the treatment of the most Extended Character, — & the accurate Knowledge of the various projectiles & of their General Laws of Flight, would obviously be of the Greatest value

effectual to a proper comprehension of the Subject of the defensive qualities of the Coat Vest, from the impact with the human body. (Ju 2½)

Prior to the year 1840, the most Almost universally Employed by the Infantry of European as well as our own armies, was the Smooth bore, Muzzle loading Musket, familiarly known in the British Service as "Brown Bess". This weapon of large calibre, throwing a round leaden ball of about the ounce in weight, possessed an effective range of not more than 100 to 150 Yards, at the utmost 200 yards.

During the infancy of the manufacture of Small arms for the Infantry, the method of loading the charge was awkward & clumsy. At first a single ball was effected by the application of a hand match a light, to the Vent of the piece. Subsequently the match was fixed in a cock which was depressed at will by the action of a trigger. This mechanism was known as the Matchlock. In 1517 this arrangement gave way to the wheel lock, which consisted of a small wheel of steel which in working, came in contact with a piece of alloy of iron & antimony — As the result of this contact, sparks were thrown off, & the powder placed in a priming pan was ignited & the charge thus communicated to the charge. The flint-lock, familiar to all was substituted for the wheel lock about 1680, & continued in general use for the Infantry until about 1840, when it was superseded by the percussion cap lock and lock.

The Cartridge was first made use of about 1744.

The bayonet, the now universal appendage to the arm of the Infantry Soldier, was first invented at Bayonne in France about 1640. Charging of Infantry with the bayonet In order of attack by charging with the bayonet was practised for the first time at the battle of Spires in 1703. The bayonet as originally attached to the piece was a clumsy contrivance, and it was simply a steel blade, with a wooden handle, inserted into the muzzle of the gun. The bayonet being fixed, the arm could neither be loaded nor fired. This evil For this wooden handle, an iron one a steel socket fitting over the muzzle was afterwards substituted.

The introduction of the bayonet brought about changes in the tactics of the battle field. By degrees the Infantry soldier was enabled to meet the shock of cavalry, which had not previously been the case.

the piece to be loaded with a series of quick, easy & speedy

Early fire Arms

(p 2)

The invention of gunpowder, at all Events as far as European nations were concerned occurred probably during the 13th century. The Earliest fire arms or guns employed partook more of the nature of mortars or cannon, and were usually designated as Bombard, mortar, vase, culverin, falcon, & balcanet &c accordy to their size, shape, or fancied resemblance. The first projectiles were balls of Stone, but these soon gave place to metallic projectiles. About the middle of the 14th century, portable fire arms were introduced, but these were of the rudest construction consisting simply of copper or iron tubes, touch hung leaden balls, and powder from flasks or horns, a priming, by hand matches. They were in fact miniature cannon, and their excessive weight requiring as they did rest or a two wheel to manage them. prevented their general use as an infantry arm.

In the Early part of the 16th century the Arquebus, and Matchlock were devised, These pieces although cumbrous were portable of being so These pieces although heavy, were still carried, & fired by a Style put Rested, and were fired at first from a rest. A Stock was afterwards fitted to the Gun, which gradually assumed the form of the musket, first by the hand of the Warrior, & later under the direction of the battle. The projectiles, first stone from the cannon Small arms, were of fixed the weight. Viz a Eight to the pound. But with the invention of the musket their Size was reduced, & the Standard of 16 a 18 to the pound was adopted.

The value of the small arms, in the hand was first fairly tested at the battle of Pavia in the year 1524; in which the Spanish soldiers of Francis I, were checked and driven in confusion by the arquebusiers and Harquebusiers of Spain.

From that time until the middle of the present Century the Smooth bore gun has played the important part in the warfare of nations. By it the fate of battles have most generally been decided; and the supremacy of the seas has been fully established.

Do X p. 2

Ratio of Shots to hits - Powerful and effective as the Infantry musket has proved, it is difficult to be, & was still notoriously inaccurate - It is difficult indeed to estimate the relation which has existed between the number of Shots fired in battle, and the number of men killed or disabled - The ratio in the Rebel Service has been variously estimated at from 3000 to 30.000 bullets fired, for every man placed hors de combat - In the Crimean war, it has been stated that the French Expended 1000 Shots, for every Russian disabled - In our own service it is believed that the ratio of Shots fired to hits made is far less - (Here insert what I can obtain)

Chambers on American 120 Mexican 800 cartridges to each soldier disabled on opposite sides - , Burke p. 19 -

The rifle, is a gun, the barrel of which contains internally a number of grooves, parallel to each other and spiraling from the breech to the muzzle of the discharge. The object of these grooves, or rifles, is to communicate to the bullet or cartridge, and to impart to the projectile a rotatory motion upon its own axis.

Windage, is the difference between the diameter of the projectile, and the calibre of the piece - When this exists, the projectile in its course through the barrel, oscillates or bounds from side to side, thus losing both velocity & integrity of course. The greater the windage, the greater is the loss of velocity, and the greater the deviation of the projectile from its true course of flight - Windage can only be dispensed, and a

In 1828, M. Delvigne [illegible] French infantry officer devised a rifle gun which although in chief of Chasseur construction, is also designed to effect [illegible] by a great [illegible] become celebrated as the first of the arms de precision - This rifle was provided with a chamber in the breech for the charge, of less diameter than the remainder of the bore - The bullet made use of was a long pointed leaden bullet, which was [illegible] inserted at the muzzle, & allowed to descend until arrested by the powder chamber in the breech part of the chamber - It was then struck [illegible] a few times with a heavy hammer for the purpose of flattening the ball the ball then received a few strokes from a heavy hammer which [illegible] to flatten a portion of the ball & cause it to enter the grooves of the rifle -

To allow motion of the ball upon the charge, the bore is turned, by causing the bullet to enter a little the grooves of the Rifle. When the piece is discharged the bullet will then follow the spirals of the grooves in the barrel, and will also retain the same motion on its flight

~~The same thing contributed to the Rifle~~ (3½ in.)

~~direction from the breech towards the muzzle of the piece~~ - The number and depth of these grooves, as well as their degree, or as it is called the "severity of twist" vary in the different calibres of Rifles - For practical purposes it has been found that the ~~guns~~ most Effective Rifling for small arms is gained by causing the ~~spiral~~ groove to describe ~~about~~ one turn in about 5 or 6 feet, and to increase in severity as it approaches the muzzle of the Gun - Most American Rifles are ~~rifled~~ made with this "gaining twist" - ~~The number of grooves in the Harpers Ferry Rifle is 4 - The depth of the grooves is .013 of an inch - The grooves are 3 in number, & are broad and shallow, with rounded angles~~ - The projecting of the metallic barrel between the grooves are also known as the Lands -

~~Such is general terms is the subject of the different forms of the grains, the principles of which has long been known~~ - ~~It adapted to the purposes of a perfect projectile for~~ by the European Powers as ~~the purposes of~~ to war is of comparatively recent origin -

About the year 1828 M. Delvigne of Paris Constructed a Rifle, ~~for~~ in which the chamber for the powder ~~should be of less diameter than that~~ of the remainder of the barrel - ~~The~~ Round balls ~~were~~ then used ~~were~~ ~~of such size as~~ were forced into the chamber ~~and~~ ~~by~~ ~~blows~~ ~~of the rammer~~ ~~so as to~~ ~~expand~~ ~~the ball~~ ~~to the~~ ~~diameter of the grooves~~ ~~and~~ ~~thus~~ ~~prevent the escape of the gas~~ ~~between the ball and the barrel~~ ~~in its passage~~ ~~from the~~ ~~breech to the muzzle~~ ~~of the gun~~, ~~and~~ ~~thus~~ ~~increase~~ ~~the velocity~~ ~~of the ball~~ ~~and~~ ~~consequently~~ ~~its~~ ~~range~~ ~~and~~ ~~accuracy~~ ~~of fire~~ ~~and~~ ~~also~~ ~~prevent~~ ~~the~~ ~~fouling~~ ~~of the barrel~~ ~~by~~ ~~the~~ ~~powder~~ ~~gases~~ ~~which~~ ~~would~~ ~~otherwise~~ ~~escape~~ ~~between~~ ~~the~~ ~~ball~~ ~~and~~ ~~the~~ ~~barrel~~ ~~and~~ ~~deposit~~ ~~upon~~ ~~the~~ ~~latter~~ ~~a~~ ~~coating~~ ~~of~~ ~~carbon~~ ~~which~~ ~~would~~ ~~soon~~ ~~render~~ ~~the~~ ~~loading~~ ~~difficult~~ ~~and~~ ~~the~~ ~~accuracy~~ ~~of~~ ~~fire~~ ~~impossible~~ ~~after~~ ~~a~~ ~~few~~ ~~rounds~~ ~~had~~ ~~been~~ ~~fired~~ ~~from~~ ~~the~~ ~~piece~~ ~~without~~ ~~cleaning~~ ~~the~~ ~~barrel~~ ~~with~~ ~~a~~ ~~worm~~ ~~or~~ ~~scraper~~ ~~to~~ ~~remove~~ ~~the~~ ~~deposit~~ ~~of~~ ~~carbon~~ ~~which~~ ~~had~~ ~~been~~ ~~formed~~ ~~upon~~ ~~the~~ ~~interior~~ ~~of~~ ~~the~~ ~~barrel~~ ~~by~~ ~~the~~ ~~explosion~~ ~~of~~ ~~the~~ ~~powder~~ ~~gases~~ ~~in~~ ~~the~~ ~~previous~~ ~~discharges~~ ~~of~~ ~~the~~ ~~piece~~ - ~~The~~ ~~ball~~ ~~was~~ ~~then~~ ~~forced~~ ~~into~~ ~~the~~ ~~grooves~~ ~~of~~ ~~the~~ ~~barrel~~ ~~by~~ ~~the~~ ~~blows~~ ~~of~~ ~~the~~ ~~rammer~~ ~~and~~ ~~thus~~ ~~expanded~~ ~~to~~ ~~the~~ ~~diameter~~ ~~of~~ ~~the~~ ~~grooves~~ ~~and~~ ~~thus~~ ~~prevented~~ ~~the~~ ~~escape~~ ~~of~~ ~~the~~ ~~gases~~ ~~between~~ ~~the~~ ~~ball~~ ~~and~~ ~~the~~ ~~barrel~~ ~~in~~ ~~its~~ ~~passage~~ ~~from~~ ~~the~~ ~~breech~~ ~~to~~ ~~the~~ ~~muzzle~~ ~~of~~ ~~the~~ ~~gun~~, ~~and~~ ~~thus~~ ~~increased~~ ~~the~~ ~~velocity~~ ~~and~~ ~~consequently~~ ~~the~~ ~~range~~ ~~and~~ ~~accuracy~~ ~~of~~ ~~fire~~ - ~~The~~ ~~chamber~~ ~~was~~ ~~of~~ ~~less~~ ~~diameter~~ ~~than~~ ~~the~~ ~~bore~~ ~~and~~ ~~only~~ ~~large~~ ~~enough~~ ~~to~~ ~~admit~~ ~~the~~ ~~ball~~ ~~with~~ ~~a~~ ~~patch~~ ~~of~~ ~~leather~~ ~~or~~ ~~cloth~~ ~~to~~ ~~be~~ ~~driven~~ ~~with~~ ~~the~~ ~~ball~~ ~~to~~ ~~the~~ ~~grooves~~ ~~of~~ ~~the~~ ~~rifle~~ - ~~But~~ ~~the~~ ~~escape~~ ~~afforded~~ ~~by~~ ~~the~~ ~~projecting~~ ~~shoulder~~ ~~of~~ ~~the~~ ~~barrel~~ ~~was~~ ~~found~~ ~~insufficient~~ ~~to~~ ~~accomplish~~ ~~the~~ ~~end~~ - Col. Thouvenin (then ~~Capt.~~ ~~of~~ ~~Artillery~~ ~~in~~ ~~the~~ ~~French~~ ~~service~~ dispensing with the chamber of Delvigne) proposed to fit into the centre of the ~~chamber~~ ~~for~~ ~~the~~ ~~ball~~ ~~to~~ ~~rest~~ ~~upon~~ ~~when~~ ~~rammed~~ ~~down~~ a steel rod ~~to~~ ~~be~~ ~~driven~~ ~~by~~ ~~the~~ ~~blows~~ ~~of~~ ~~the~~ ~~rammer~~ ~~and~~ ~~thus~~ ~~expand~~ ~~the~~ ~~ball~~ ~~to~~ ~~the~~ ~~diameter~~ ~~of~~ ~~the~~ ~~grooves~~ ~~and~~ ~~thus~~ ~~prevent~~ ~~the~~ ~~escape~~ ~~of~~ ~~the~~ ~~gases~~ ~~between~~ ~~the~~ ~~ball~~ ~~and~~ ~~the~~ ~~barrel~~ ~~in~~ ~~its~~ ~~passage~~ ~~from~~ ~~the~~ ~~breech~~ ~~to~~ ~~the~~ ~~muzzle~~ ~~of~~ ~~the~~ ~~gun~~ - ~~The~~ ~~rod~~ ~~was~~ ~~then~~ ~~withdrawn~~ ~~from~~ ~~the~~ ~~chamber~~ ~~and~~ ~~the~~ ~~powder~~ ~~charge~~ ~~ignited~~ - The rod would ~~then~~ ~~be~~ ~~withdrawn~~ ~~from~~ ~~the~~ ~~chamber~~ ~~and~~ ~~the~~ ~~powder~~ ~~charge~~ ~~ignited~~ - The rapidity thus imparted to the ball was known by the Canadian-a-tige ~~was tested by~~ ~~the~~ ~~Commissioners~~ ~~appointed~~ by whom it was employed with great effect by certain corps of the French army ~~during the Italian campaign~~

An alteration in the shape of the ball was subsequently proposed by M. Delvigne - ~~This~~ consisted in the substitution of a cylindro-conoidal ball, with a flat base for the round ball previously in use - ~~This~~ A higher velocity and greater range for the projectile was thus obtained - The ball when discharged made the rear face of the air behind the centre of gravity thus preserving the rotation of the ball To diminish the resistance in the flight of the ball, Capt. Tamisier of the French service in 1841, proposed the cutting of cylindro-conical grooves on the cylindrical portion of the ball - ~~By this means the~~ The flight of the ball was thus steadied in the same manner as that of an arrow by the feathers - The Canadian-a-tige of Thouvenin, with the grooved cylindro-conical leaden projectile was extensively employed

Such in general terms, is the interior structure of the rifle, or fire arm which has been long been known, but the principles of which has been imperfectly understood - The first rifle is said to have been made at Vienna about the year 1500 - It possessed two straight grooves parallel to the axis of the bore, ~~in which was~~ intended simply by the ~~Nuremberg~~ maker to afford ease in loading tightly fitting balls - It was afterwards found that the spacing of the ~~grooves~~ could be improved by the hand by an artist to the Rifle or groove, a special twist. ~~In order~~ of the hunter ~~or Sportsman~~ the value of the rifle has ~~the Rifle although~~ ~~for Hunting purposes~~ has not been exceeded long been recognized - Its Efficiency however ~~is publicly authentic~~ dated the commencement as a weapon of war was not conceded ~~until~~ ~~it was~~ by, Military Authorities, until recently - ~~It~~ It is true that during the last Century attempts were made to introduce the Rifle into military use, & bodies of Rifle men -, Sharpshooters, & riflemen were attached to all large armies - But these commands, although available as skirmishers, could not be made to act in the same manner as the infantry of the line - The rifle ~~Regiment~~ was heavy & unwieldy, was loaded with difficulty, and after a few discharges fouled from the effects of the ignition of the powder. It was in fact a weapon solely for the use of Skirmishers & partisans, & such was largely employed in the American revolution of 1776. During the wars of Napoleon the use of the Rifle was discontinued in the French armies, although every effort was made to induce the French soldier to use the Musket the rifle or tirailleur. - ~~It~~ It will thus be seen (over)

that the Rifle Rifle is by no means a modern weapon,
although the adaptation to it of a projectile suitable for general
military use, is of comparatively recent proceeding.
The problem to be determined, was the construction of a projectile
which could be loaded & fired rapidly, & which could be made
to take the rifles of the principal European countries.

1828 constructed a rifle, having in the breech a chamber for the charge of Coal [illegible]
than third of the bore — the [illegible] An ordinary bullet fitting tightly [illegible]
was then inserted at the muzzle, and

+ with great Effect by the French Chasseurs during the Italian campaigns.

Minié Ball

The object The Specific increase to the arm of Lt Col. Minié, is the stability of the projectile when in flight to become disarranged, & the facility of cleaning the weapon — To obviate these objections Col. Minié ~~invented a bullet~~ about 1850 invented a bullet so constructed as to fill the grooves of the rifle by the action of the charge at the moment of explosion. This bullet (see fig 2) was cylindro-conical at the base, with a conical hollow in the base. Into the wider end of this hollow a light felt wad was placed, which at the instant of the explosion of the charge was driven up towards the narrow end of the conical hollow, thus expanding the sides of the bullet & forcing them into the grooves of the rifle. The object of this wad is the stability of the wad at times to keep the charge drive, into the base of the bullet, & thus fit it for accurate flight. At a subsequent period, the iron cup was dispensed with, & the effects previously obtained by using the elongated bullet with a shallow triangular cavity in its base. It was with this projectile adapted to old pattern smooth bore muskets which had been rifled, that the French infantry of the line was armed during the Italian war.

2

3

from nature

Enfield Ball

Following the example of the French soldiers, the English about the same time that the improvement was by introduced in the arms of the French soldiers, analogous changes were effected in the bore & projectile of the English musketry. Employed by the British infantry — after a series of experiments carefully conducted, the Enfield rifle, & bullet was devised — The latter being constructed on the same principle as the original Minié bullet, with this exception that the cavity in the base of the elongated projectile, is fitted with a wooden plug, which by the explosion of the charge causes the Expansion of the base, as already described. Vast numbers of the Enfield bullets of English manufacture were used by the Rebel troops during the recent war — Their appearance is doubtless familiar to all of our military surgeons. In the Experience of the writer, the wooden plug has always been found more or less embedded in the base Extracted from wounded Soldiers. —

The wooden plug also serves to preserve the shape of the bullet, & prevent bruising or mutilation during transportation — The English bullet is not furnished with grooves on its cylindrical portion — The weight is 530 grains

Whitworth barrel & rifle

15

Another gun, which has attracted much attention in England, & which is indeed considered superior in nearly every respect to the Standard Enfield rifle, is the celebrated Whitworth rifle. The peculiarity of this gun, is its hexagonal bore, or the absence of grooves. The spiral described by the bore is about one turn in 20 inches. The projectile for this rifle is of hard alloy of lead, and is somewhat in the shape of a bolt, its length being equal to three diameters. The bullet is accurately made, its sides being diagonally flattened hexagonally so as to fit the bore. (Page 4) The range of the Whitworth rifle is very great, some 1700 or 1800 yards. The velocity imparted to the missile, & its accuracy & destructive effects are surprising. This weapon was employed to some extent by the rebel Sharpshooters of the army of Va, & with terrible effect. In one instance which came to the knowledge of the writer, a soldier of this army of the Potomac was hit by a Whitworth bullet, fired from the distance of a mile at least, & which fractured both thighs bones.

Book 104.

15

Lancaster rifle, also a famous English pattern of gun, possesses a small elliptical bore, with a spiral of one turn in 32 inches. The projectile which is completely made, is made to fit the bore accurately by the expansion of the Explosion of the Charge. Its range, precision of fire, are said to be very great, but its employment during the rebellion has probably been but limited.

The Standard rifle musket of the U.S. service, is known as the Springfield pattern, pattern, so called from the Arsenal at which they are manufactured - The barrel of this arm is about 40 inches in length and its calibre .58 inch - The grooves of the rifling are three in number, each one being equal to one depth of the circumference of the bore - The twist is uniform, one turn being three turns in six feet - This gun was originally designed for 1200 yards, but for the practical purposes of the late war, the sights were reduced to 100, 300, & 500 yards

Character of the ~~Arm~~ small arms & projectils Employed by the U.S. troops during the Rebellion—

~~In the~~ At the Commencement of the Rebellion, ~~at a time~~ when the ~~Smooth~~ old fashioned Smooth Bore Musket was ~~in general~~ issued to the Rank & Files of Infantry, the ~~projectils~~ Cartridge Employed were either the Single round ball, of about ~~the~~ one in weight, ~~or the~~, ~~the~~ ball, ~~or~~ three buck Shot ~~Cartridge~~. The former was the well known round ball, of about one ounce weight; the latter the same ball, with the addition of three buck Shot—

~~As the Rifle & improved Arms~~ ~~At first as the Rifled weapon was~~ ~~distributed, a change~~ But when the Rifled gun was placed in the hands of the Soldier these Cartridges were discarded, ~~and in their~~ in favor of the place was substituted Elongated, ~~projectile~~, a Cylindro-conoidal projectile; or as it has been almost universally & erroneously termed the Minié bullet— In the manufacture of these destructive projectile, American ingenuity taxed itself to the utmost— The general shape of the ~~ball~~ bullet remained the same, as but its variety was very great ~~almost unlimited~~. A collection of these leaden projectils for Small arms of all calibers & kinds as have at different periods of the Rebellion been Employed by the U.S. troops, includes not less than eighty different patterns.

The chief of these are first
1. The Elongated Cylindro bullet of ~~the~~ varying Sizes, ~~intended~~ adopted about 1855 the general use according to the Calibre of the ~~Piece~~ from which it was propelled. This bullet for the rifle musket ~~is~~ in general Sharply pointed, ~~& are provided~~ with three grooves ~~upon~~ around its cylindrical portion. The base ~~is hollowed out on~~ contains a conical cavity, ~~in the bottom of which~~ the walls of which are forced into the grooves of the rifle by the Explosion of the charge. The length of the bullet ~~is~~ about double its diameter at the base, & its cavity ~~is~~ ~~provided either~~ with the iron cup of the original Minié ~~bullet~~, or with the wooden plug of the Burnside Enfield— Butterfield bullet—

Elongated Bullet / from rifled musket

2d. This projectile ~~is~~ has been frequently & erroneously spoken of by medical officers as an Explosive Shell ~~& a compound ball, but from the fact that the~~ bullet— ~~There is no Explosive in the bullet is not explosive.~~ It is in reality a compound projectile & consists of the portions 1. The leaden Cylindro-conical body of the ball, ~~provided~~ with a central cavity, 2. The leaden base, with a projecting stem or shank, ~~which~~ the entire length of the cavity ~~projects~~ into the cavity of the body of the bullet, but ~~does~~ not exceeding ~~the length of the whole length~~, 3d. A prepared concave-convex disc of Zinc ~~Cloth~~ felt, between the two portions of the ball with the concave convex ~~towards~~ the base of the bullet. The action of this projectile is very simple— On the Explosion of the charge, the leaden base with its stem is driven forward into the body of the bullet— Pressure is thus Exerted upon the convex portion of the Zinc disc, which becomes flattened & ~~enlarged~~ thickened in diameter— The circumferential Edge of

Williams bullet (Virginia)

Osteo-myelitis

Chest Wounds

Abdom.

Joint Wounds

Long Bones

E

Ethmoid

Head

Chest

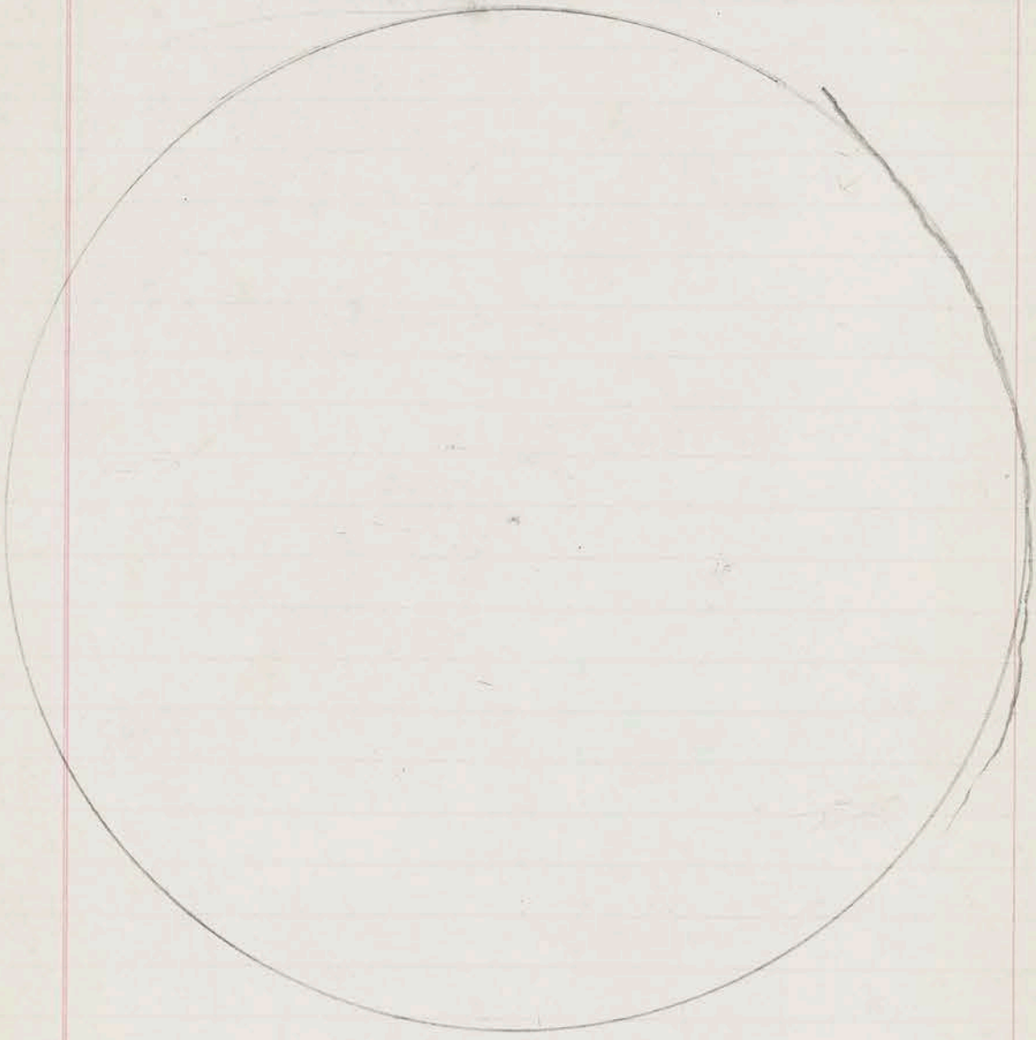
Belly

Osteo-myelitis

Dec Jan Stomach

Gen. Progress of Stomach Cases

Models Transcontinental Journey.



Gentlemen, Fellows of the College

By the terms of foundation of the Mütter lecture-ship, it is provided, that the ~~[illegible]~~ Course of Lectures to be annually delivered under that endowment, shall be "upon some point or points connected with Surgical Pathology."

The topic which I have selected for our consideration in the ensuing course, is that of "Gunshot injuries."

But although this subject in itself, is one of most fertile interest, I must yet confess to a certain hesitancy, in making it the theme of my discourses before you now

Time was, not very long since, when the demands and exigencies of a great war forced most strongly upon the profession the consideration of this class of accidents. But happily for us that time has passed away; The People's mind is no longer dwells upon the desolations of War, or ~~[illegible]~~ see Land complacently to devise more ample means for the destruction of human life,

For now our Land is at peace

Time, with his all healing wings has already

already touched many a sore left rankling and festering from civil Strife — Harsh feelings have softened; bitter memories have dimmed — The events of the Nations struggle are bye-gone; and the rapid development of the Arts of Peace, had all but obliterated, the impress of the ravages of war.

In a word, the curtain has gone down, upon that ~~weary~~ weary and hideous drama of blood and suffering, — the Conflict of Sixty-one. The actors have left the stage, the audience have dispersed; the lights have been turned off; And Actor and Spectator alike would willingly forget that such a tragedy had ever been played.

But to us as Surgeons, the War has been full of interest, an interest, which I ~~have~~ believe has not yet died away. For it has displayed before our eyes, great classes of accidents, of which we otherwise would have seen but few. —

— What it is to the Study of these casualties, that I would now invite Your attention.

Serve - 438 - Russian incendiary & explosive ball - copper capsule filled with percussion
439 - Travelling of a Bullet between 2 pts -
442 Importation of arms &c &c 1870.

Gs. of Head	5046.		5	0	4	6	10.542.	or 13.55 p.c.t	
face	4167		4	1	6	7			
neck	1329		1	3	2	9			
Back & Spine	5195		5	1	9	5	5382	7.92	" "
Prod. of Vertebra	187			1	8	7			
Chest	7062		7	0	6	2	7062	9.08	" "
abdomen	2707.		2	7	0	7			
Pelvis	359			3	5	9	3523	4.53	"
Genito-Urinary	457			4	5	7			
Upper & L	21.248	2	1	2	4	8	21248	26.08	"
Lower	30.014	3	0	0	1	4	30.014	38.59	
	87861	7	7	7	7	1			
	2787								
	2766			2	2	4	4	3	
	2256					7	6		
					1	0	6		
					1	4	3		
				2	8	8	3		
					3	6	3		
				1	0	3	5		
					7	5	4		
			8	3	1	7	8		
				1	3	4	3		

= 99.70 +

1. Arms & Projectiles

2. - Theory of Flight of Bullet -

3. Effect of Ball striking a Soldier — Symptoms — Shock: Death.

4. ~~Cont~~ Local Effect on tissues - Entrance & Exit - &c.

5. Chemikes — Bones & Joints

6 Head -

7. Lungs —

8. Belly —

~~9. Ost-Myelitis - Gangrene - Erysipelas - Tetanus.~~

9. Secondary Hemorrhage - Tetanus

10 - Osteo-Myelitis - Gangrene - Erysipelas -

General Prognosis - Transportation -

well supplied as to arms & ammunition, as early as ~~the~~ November
1861. The Enfield rifle at that time had been obtained
~~was largely used~~ in large
numbers. Very many of these troops, were also armed
with the Mississippi & Western rifle, a formidable
weapon, and one which in Expert hands, carried
havoc into the ranks of ~~them opponents~~ the U. S. troops. At a
later period, as the industrial resources of the South developed,
public manufactories ~~were~~ established. In some
of these, as for example the Tredegar works, which contained
the ~~manufactory~~ gun machinery formerly in the U. S.
Harpers Ferry armory, ~~excellent~~ & serviceable arms
were turned out. ~~Many~~ Small arms, generally, ~~and~~ by the rebels, ~~in~~ ~~Europe~~ ~~and~~ ~~by~~ ~~the~~ ~~rebels~~ in different parts of the country
Specimens of all
~~the~~ ~~to the Cavalry~~ ~~service~~ At the commencement of the
War, ~~the~~ Cavalry ~~arms~~ were a favorite branch of the service
with the rebels, & the men, ~~most~~ frequently ~~often~~ owned their
own horses & well mounted. Their arms
were the Sabre & Revolver, especially in the West
& not unfrequently each
Mounted man carried in addition a double
barrelled hunting piece. The rebels have as a
rule relied in action greatly on the use of their
fire arms; ~~This confidence, which if carried too far~~
~~became~~ ~~recklessness~~, ~~has resulted, and eventually led to~~
This confidence in fire arms, was by them carried too far, and ~~in~~ ~~which~~ them
at a later ~~period~~ epoch in the war to meet ~~in~~ hand to hand
conflict, the sabre charge of the ~~rebel~~ U. S. cavalry.

Defensive Armor — The ~~variety of~~ defensive armor has ~~also~~ been employed & authorized
by the ~~U. S.~~ Government. Early in the war, attempts were made by ~~the~~ New England
Company to ~~have~~ manufacture ~~in shells~~ Jeffries Steel Armor, whose powers of resisting bullets was greatly vaunted —
One of these, pierced through & through ~~by~~ two pistol balls can be seen at the Army Med. Museum in Washington
— It was taken from the body of a rebel officer at Gettysburg —"

The Small arms projectiles used by the Rebel infantry ~~are of many~~ were mallebanes
The Rebels have been allowed to ~~have~~ from different battle field Specimens of ~~the~~ their Infantry
Variety of Rifled & ~~cylindrical~~ bullets.

Rifle cannon became the rage, Before many months, the smooth bore guns were discarded, & in their place, the improved pieces substituted. But the experience of one or two bloody actions showed, that the reform in this respect had been too sweeping. Valuable as rifled cannon might be in their proper place, smooth guns in its proper place are not less so. The composition of the artillery was accordingly revised, a proper proportion of smooth bored cannon being distributed. The field artillery as now constituted, is composed of the smooth 12 pounder; and the three inch rifled gun either of the Ordnance model, or which is known as the Parrott. The rifled ten, & thirty pounder Parrott, at one time in vogue, have recently been withdrawn from armies in the field, in active campaigns.

It is scarcely necessary, here to speak of siege guns, & heavy guns, mounted in forts & defensive works. These are of every calibre, from the rifled 10 pdr, to the monster two hundred pounder of the Swamp angel battery.

<u>Arming of the Rebel troops</u>. It is difficult of course, on this subject to speak with accuracy. It would appear however, that the rebel forces were fairly armed in the earlier campaigns of the war. At this time, Either from good management on the part of the Sec. of War, or treachery at Govt., the U. S. arsenals in the insurrectionary States, were well stored with government arms. All these, with the single exception of those deposited in the St. Louis arsenal fell into the hands of the Rebels. Large numbers of improved arms and munitions of European manufacture were also brought over by blockade running vessels, & in the East, much material of war, was captured in battle by the insurgents.

The rebel armies of the west, were unfortunately

~~they~~ may be their large calibre, (.69), sixty nine hundredths of an inch, allowing a ball of such weight, as rendered it difficult for the troops to carry a sufficient amount of ammunition. These rifle muskets were subsequently called in, & other pieces supplied in lieu the regulation U. S. rifled musket, of the calibre of .58. As many of the English & Enfield rifles, (calibre .577) which were, ~~in use~~, & Elongated bullet of ~~bullet~~, ~~ball~~ of a calibre .577, & suitable for all rifle muskets in service was adopted. The diameter of this projectile was again still further reduced towards the close of the war. During the war a few regiments, were armed with four shooting rifles, of long range. From their marksmen, much was expected, but it is questionable, despite the newspaper correspondents, whether they have at any time inflicted any serious loss upon the enemy, or realized the anticipations which had been formed as to their accuracy of fire.

Arms of the Cavalry Service. In the early part of the war, the mounted troops were armed with Sabres, and Colt revolving pistols, of large ~~or Army~~ size. In addition ~~to these~~, they were subsequently furnished with ~~Carbines~~ breech loading carbines, of Sharps, Hall, and ~~Maynard~~ other patterns as fast as they could be procured. ~~At~~ At a later period in the war, and after the organization of a Cavalry Bureau, this arm of service was modified & it was ~~the Cavalry was adopted~~ that each cavalryman should be armed with a Sabre, and only one fire arm, either the revolving pistol, or the carbine. The ~~Carbines~~, forms of the latter which were most esteemed, were the Spencer, & Henry repeating Carbines, for which Metallic cartridges are used. The employment of such a formidable long range weapon, has gone far to substitute the efficiency of the cavalry, arm of the service and indeed has enabled this arm of the service, dismounted, to meet and repel dismounted, an enemy's infantry.

Artillery. At the outbreak of the rebellion, the U.S. field artillery was composed entirely of smooth bore guns. Rifled pieces had not ~~been~~ been introduced, and indeed but few pieces were to be found in the country, & these were in the hands of Experimentors, and ~~invalids~~ and artillery ~~of~~ in relation to cannon of precision. The absence of an improved field artillery, was regarded as a great deficiency, to remedy which vigorous measures were at once adopted, & rifle cannon became the rage

Arming of the U.S. forces during the war of the Rebellion -

nearly all of
Infantry. The ~~three~~ troops first called into service, in the early part of 1861, and ~~three~~
known as the "three months men", were armed with the Old Smith
bore musket of the pattern of 1822, (calibre .69.), altered to percussion
locks, or else with the Smith bored percussion musket of 1842. - A ~~few~~ few
of the ~~two York~~ regiments from N.Y. & New England carried the
new Springfield rifle muskets of 1855 - These were returned
from the States service furnished by the U. States. The infantry
of the regular army were all provided with the improved Springfield
arm -

The five hundred thousand levy, was called for by act of Congress in July 1861.
To these troops, twenty five thousand ~~were provided with the~~ Springfield rifle
Muskets, ~~which were~~ all that could be prepared during that
year, - ~~with these arms~~ with these arms, the regular regiments in the western armies were
supplied, and the ~~Eleventh~~ Rest were distributed to the troops of the army
of the Potomac. - The remainder of this levy were furnished with
Smith bored arms, of which about 125,00 were of inferior
foreign manufacture - ~~The Smith guns of this~~ ~~matter at that time in use in the various armies of the U.S.~~
~~was though many were mostly altered from both muskets of~~
~~the Old pattern, but they were then by many considered~~ ~~very~~ terrible weapon.
~~The Chief objection, as to their use, apart from the~~
~~tendency of fouling was their large - At the same time,~~
~~the Smith muskets they were "rifled" by the the Government -~~
During the latter part of the Year 1861, the government arsenals were busily
employed in "rifling", & grooving, the Smith bored arms in store - as fast as
they could be done, they were issued to the troops, in lieu of the "Smith
them in their hands. The ~~the~~ muskets ~~then~~ altered were ~~mostly~~ of
the old patterns
~~the flint lock~~, of 1822, & 1842, but when "rifled" proved to be
very & terrible weapons - The chief objection to them

Springfield - Wilsons Creek Aug 1. 10/61
Belmont - Nov. 7/61
Ft Henry Feb. 6/62
Donelson " 16/62
Shiloh Apl. 6/62
Corinth - May 30/62
Iuka Sep. 18/62
Perryville Oct. 7/62
Murfreesboro Dec 31/62

Vicksburg July 4/63
Port Hudson " 8/63
Chickamauga Sept. 2/63
Lookout Nov 24/63

Yorktown May 4/62
Williamsburg May 4/62 - 7 days
1 Bull Run July 21 1861
2 " " Aug 30 1862
Antietam Sept. 17 1862
Fair Oaks May 31/62
Gaines Hill June 27/62 — Malvern July 1 1862
Fredericksburg Dec 12 1862
Chancellorsville May 2 1863

Grant Wilder's address
May 4/04

consequently forced into the grooves of the rifle, & a rotary motion is thus
imparted to the bullet, while at the same time the ~~gas~~ rifle grooves
are thoroughly cleaned by the scraping action of the ~~lines~~ disc ~~in its passage~~.
~~The object of this projectile, in its passage through the barrel, is~~
Indeed the object of the projectile was designed by
~~Not only to serve the purposes of~~ a projectile, but
but at the same time ~~seem to~~ cleanse the weapon from which
it may have been discharged - It has been the
custom of the Ordnance Department to issue to troops the
Cartridges projectile in the proportion of about one, to ten
of the ordinary Elongated bullets -
~~A table from the inspector~~ Regarded from a professional point of view, this projectile
is one of ~~great~~ commercial interest - ~~It may have~~ It may thus be the
~~body~~ ~~of the~~ bullet, ~~for frequently appears~~ that there ~~to be~~ the necessity of
~~bullet from the body~~ extracting from a wound, the three portions of this
~~bullet, firmly & compactly~~ firmly impacted together may
be extracted from a wound, ~~such~~ This I believe ~~of~~ is
~~must totally to occur~~ apt to be met with, when the projectile has entered the body
without first having impinged upon any external object - Should
however the latter occurrence have taken place, the ~~bullet~~ elongated
portions of the bullet may be readily separated, producing probably multiple
wounds in the same person, a wound ~~by~~ more than one
~~Hay~~ separate of the different parts of
~~the projectile thereby~~ by contact with ~~the~~ bone
has also been observed by the writer, ~~in a case~~ when, the
~~three~~ bullet has entered as it were en masse at a long & open
~~Having entered~~ wound - The importance of thoroughly inspecting
our ~~examination~~ in all such cases is too obvious to ~~require~~ further
Comment.

Shaler's Sectional Bullet

~~This projectile, which is~~ Represented at fig..... is a comp^d non Explosive Cylindro
~~projectile~~ bullet - It consists of three ~~flat~~ hollow cones of different sizes, fitting ~~the~~
One within the other - Placed in the barrel of the piece
in action it is that of a ~~bullet~~ ~~the~~ cylindro
-conoidal projectile - ~~When~~ flying ~~by~~ flight, ~~the component parts~~
~~the bullet~~ by upon impact the component portions of
the bullet separate, each one of which thus becomes an
~~Missile~~ independent ~~projectile~~ - ~~This projectile~~ Shaler's Sectional bullet
has been employed only to a limited extent.

The Whitworth bolt or Bullet

Used to some ~~extent~~ by Rebel Sharpshooters, ~~as~~ is a projectile
~~projectile~~ possessing distinctive qualities - ~~It~~ Length ~~the~~
~~the cylinder~~ three times its diameter, or even more, is greater
than that of the ordinary Elongated bullet - The Whitworth

rifle from which it is fired has a hexagonal shell bore, without grooves, making one turn in 20 inches. The range of this arm is very great, & the force & velocity imparted to the missile is surprising. In one instance where came to the knowledge of the writer, a Soldier of the army of the Potomac received a shot from a rebel at a distance of more than a mile & a quarter which passed through the thigh bones.

Gun Cotton Explosive Shell Bullet

Much has been said by military writers, & the frequency of wounds from Explosive leaden balls. It is probable that this subject has been much exaggerated

Here is the only Explosive missile for small arms which has been actually employed at all. It was designed for the firing of Caissons and ammunition wagons & trains. The construction of this projectile will be evident by reference to the cut. It consists of a copper capsule filled with powder, imbedded in the base of an ordinary elongated missile. The bursting charge in the capsule communicates with the External surface at the base of the bullet by a time fuse, which explodes in one quarter of a second after the charge is fired, in other words at about 250 yards from the muzzle of the piece.

It is stated on apparently good authority, that an Explosive percussion bullet was employed by the rebel Military Authorities, recently in their western armies, & experimented during the Seige of Vicksburg. I have never however succeeded in procuring a specimen of this projectile, nor do I know any Officer who has seen one. I have however heard from a reliable source that when a bullet has exploded in the body of a U.S. soldier, what was the nature of the projectile, which acting on the percussion principle, & provided with a time fuse, I could not learn.

The use of the Explosive bullet, is not altogether novel. Experiments with a Explosive bullet, called Shell, were made as far back as the year 1823 by General Jacob of the East India Service, and a model of an Explosive Rifle Shell was devised by this officer. A leaden bullet of the same nature has also been made by Devisme, a gunsmith of Paris. It does not however appear that either of these projectiles have ever been employed to any extent either in the British or French Service.

Breech loading guns. The Europeans projectiles already described, are those intended only for muzzle
& their projectiles loading guns. The inconveniences of these, arising from fouling, the
necessity of ramming, the comparative length of time required to charge &
discharge the piece, & the inability of the Soldier during action to place more than
One Cartridge in the barrel have long been recognized. To obviate these
Objections, repeated efforts were made by the European gunsmiths to fabricate a
reliable breech-loading weapon. But with the single questionable exception
of the Prussian needle gun, they have failed.

The advantages offered by a breech loading arm which can be loaded at the breech
are very great, & consist chiefly in the ease & rapidity
with which it can be loaded, and
fired, & the possibility of the bullet's being in position until discharged
of the ramrod. The projectile adapted to the Elongated projectile
principles herein, when used in the discharge of a bullet
from a breech loading arm obtained those in muzzle loading fire arms, - in the former will
be exact. But the manner in which the projectile is made to take the
grooves of the muzzle & breech loading gun. - In the former
it will be remembered that the rifling principle is attained
by the explosive force of the powder, causing the expansion of the base of the
Ball. - Each is not the case with the bullet, as is supposed
it theoretically called to produce this process. But in the latter
a new principle is introduced, dependent entirely. The projectile is
of smaller diameter than the bore of the gun, and a compressible
Thin Case is made, to fit into a chamber in the rear end of the barrel
of the Calibre Chamber, also of greater diameter than the calibre of the
piece as Exhibited in the rear end of the barrel into the chamber, the cartridge
is placed. - The barrel is here composed of two portions, a long or
rifled part, and a chamber in the rear of greater calibre, into
which the charge & projectile fit. The latter is of greater diameter
than the bore of the rifled portion of the barrel. It is evident
therefore that when the piece is discharged, the soft leaden bullet
is violently forced, through into the narrower Rifled barrel, and is thus made to

Fills the grooves, in an exactly reciprocal manner as it is forced
Shape, call flat bars, thereof the Rifling Cannon exemplifies

The Bullets for breech loading arms are

The breech loading arms issued to the U.S. troops during the rebellion were the carbine & revolving pistol of various patterns, for the mounted Cavalry, & towards the close of the contest ~~Certain~~ the Spencer repeating rifle for infantry, supplemented by the most perfect weapon known. The cartridges for many forms of breech loaders, especially for the carbine and repeating rifles were generally metallic, and all waterproof. The detonating powder for the ignition of the charge was placed in the base of the cartridge. The use of the percussion cap, was thus dispensed with, and great rapidity of fire was obtained.

(9)

Projectiles for cannon. The introduction of the improved Rifled cannon for infantry was speedily followed by a similar change in the construction of cannon. Experiments having thus fully set in train, being conducted lynchronously by the leading military nations of the world, each on of whom finally selected as an effective model of gun. The rifled field pieces employed in the Crimean war, the 12 pdr rifled field gun, the rifled gun employed in the Italian campaign of 1859 being cast iron & made of iron & bronze, with an increased weight of metal at the breach, a jacketing. The guns thus constructed were capable of throwing with equally shot, shell, & canister, & grape & canister, at well as the grape, peculiar to the adaptation of the rifled field gun & cannister, suitable to the action when masses of troops at comparatively close distances from to the adaptation of the rifled field gun, the projectiles with the projectiles fixed with the smooth bore cannon are round shot, round shell, Shrapnel case or shrapnel, & canister, grape & canister. In the rifled cannon the projectiles are partly more complicated.

Round Shot. The round shot or solid round shot, usually known as the cannon ball, is formed of cast iron and made to fit every one, & requiring no special description.

The round shell, now generally supplanted in use by the Shrapnel, a hollow shot is simply a hollow cast iron shot with an aperture for the fuse. The interior of the shell contains a small quantity of powder, which being ignited by the fuse bursts, scattering the fragments of iron in every direction. The fuse should be arranged, so as to burn a certain time, at which it is desirable to explode the shell, regulates the nature of the fuse. In using the simple shell to employ the simple shell effectively it should be exploded over, or among the bodies of the troops against which it is intended to act.

Shrapnel or Spherical case. Shrapnel called also Shrapnel from the name of the inventor, consists of a hollow cast iron sphere, a cast iron sphere, containing the cavity of which contains a number of bullets, embedded in sulphur to prevent the shifting, a certain quantity of powder, known as the bursting charge. The shell is provided with a fuse so prepared as to ignite the bursting charge at any given moment of time. In employing this projectile, against troops, the elevation is made to cause it to explode from 500 to 100 yards in front of, & 20 feet above the heads of the enemy. The distance at which Shrapnel case, fired from field guns, can be used with the greatest effect is from 500 to 1500 yards. In Indian Campaigns, Shrapnel is employed, especially against & when advancing through, or cautiously

Ref. Scientific Dict p. 563

Barton 77

a a Hand of Grape, consisting

Grape, or Grape-Shot, are iron balls placed ~~in boxes~~ in
three ~~tiers~~ one on top of the other, & retained in position by iron
iron plates, ~~& two solid iron rings~~ & a long Metal screw
In the U. S. Service the use of Grape from field guns has
been discontinued, - It has however been employed
in the field by the rebel artillerists.

Canister. - This form of projectile is chiefly resorted to, to effect the
destruction of an enemy at short range.
It consist of a tin cylinder or can, filled with cast
iron balls & Sawdust. When there is
called not to proceed this
~~Case has been adopted~~ of cast iron
~~tin plate~~. The Effective range for field Cannon
is from 300 to 600 yards

packed in Sawdust

The following are the chief varieties of Elongated projectiles, furnished by the U.S. Ordnance Bureau for field purposes—

The Hotchkiss Projectile—This is composed of three essential portions, first, a cast iron, conical body; second, an iron base or sabot; and third, an intervening band of lead or soft metal—By the explosion of the charge, the sabot is driven forward upon the conical body of the projectile, expanding the leaden belt, which is thus forced to take the rifles of the gun—

The Schenkl projectile—This consists of a cast iron Conoidal body, with a conical base—Around this base the place is wrapped the Expanding portion, a thick wad of paper Mache—By the Explosion of the charge, the wad is driven forward on the cone, & is thus forced into the grooves of the piece—On the projectile leaving the muzzle, the wad is thrown to pieces—

The Parrott projectile, is an Elongated cast iron bolt, with a cylindrical base, in the base of which a thick flanged ring, is cast—When the piece is discharged, the gas insinuates itself under this brass collar, which is made to take the grooves.

The James Hoch projectile, now deemed fallen into disuse was an Elongated cast iron bolt, with a conical cavity, penetrated centrally—through the base and flanged iron cup—into this cup, & on the penetrated, was placed a backing of Sheet tin, and lead, which was Expanded by the action of the gas, from the cavity in the base of the projectile, pressing out at the moment of discharge—

Other varieties of projectiles intended for rifled cannon are cast, with flanges on their sides corresponding to the grooves of the gun—By casting the surfaces of these flanges with soft metal, the contact between the projectile & the piece is softened—

The Sabot

Ove

against Masses ~~of men~~ columns of men the results have is very terrible –

The Sabot. In firing round shot, upon field guns it is customary to attach the projectile to a wooden block, upon the opposite side of which the bag of powder, a cartridge is attached. The round of ammunition thus arranged is known as fixed ammunition – In case

~~Elongated projectiles for rifled cannon~~. There are vastly more complicated than those which are employed with smooth bore guns, The projectile being of cast-iron can not be made to fill the ~~grooves~~ of the gun ~~so as to accurately~~ without which the rotary motion about its long axis cannot be acquired. To accomplish this result Lead is usually used to as base metal and the shot is bound with it, To ~~this~~ lead is found to impart a rotary motion upon its long axis, it is necessary that its sides should be pressed into the grooves of the piece – As this cannot be effected with cast iron, ~~of which it is made~~ from a belt of lead for the projectiles for cannon must be made, ~~except to load~~ to the ~~rifled~~ projectiles, for rifle cannon

The lifting pressure when obtained ~~introduced~~ in cannon, necessarily ~~has to be changed~~ the nature of the projectile Here As in the ~~bullet~~ shell used it was ascertained that the ~~leaden~~ ~~of the shot~~ should be made to ~~fill~~ the grooves of the Gun, ~~in order that a rotary motion when it was upon~~ ~~might be obtained~~ – But in the Elongated bullet ~~to be fired from~~ for cannon ~~must with them~~ being as made of iron, the principle of the Expansion of the base, as in the Minié ball was of course applicable, To ~~obtain~~ obtain the desired End ~~what~~ has been had to the manufacture of ~~compound shot~~ Combined Shot, ~~composed of~~ – ~~Projectiles~~ Projectiles may be considered as composed of three portions – An iron body, an iron base, a tablet & an intervening band of lead or other soft metal. By the explosion of the charge the tablet is driven forward upon the body of the projectile, & the ~~leaden~~ band, expanded as previously stated is made to enter the grooves of the gun.

at fig ..... ~~Here~~ such a projectile as Hotchkiss shell is represented. – Other methods ~~of~~ slightly differing from the ~~one~~ above given have been ~~Experimented~~ Employed in the manufacture of ~~elongated~~ projectiles, but the general principles of the same. The Elongated projectile ~~chiefly~~ used in the U.S. ~~rifled~~ rifled cannon, are those of Hotchkiss & ~~Hotchkiss~~ Schenkl.

The Hotchkiss & Schenkl projectiles, ~~when described~~ as called from their respective inventors are those now chiefly Employed in the rifled cannon service of the U.S. Armies.

a clap of wind which the Rebels began to Cheer.

Called upon to load, one Man ~~from~~ resulting from ~~what was called~~ Stuffing
~~Hat~~ his fragments of the leaden band of ~~the shell for the Elongated~~
which became detached during the flight of the Elongated projectile.
During the invasion of Chain by the British during the Revolutionary War
~~in the~~ ~~having of the use of~~ these Elongated projectiles ~~of the Chamber~~, it is reported
that the Rebels infantry were injured by them Shrapnel from
the Shot of the Arming guns, found over their heads.
Fortunately, the ~~Imperfection~~ exception of the manufacture of the new projectile
used in the U.S. ~~Army in Cuba~~ field guns, is such that
this accident is of comparatively rare occurrence. The
Author has known Known ~~instances of the the accident to~~ it to happen
~~happen~~, when Brass guns of large Calibre have been fired
over the heads of our Troops.

That although the so called wind wounds are rarely fatal- both, severe contusions from rebotting or spent ~~shot~~ wound shot- a shell are sufficiently common- The following case observed by the writer & an eyewitness of such accidents -

Colored C....

~~A~~ a distinguished and ~~brave~~ subaltern officer, whilst sighting a heavy gun, at a critical moment in ~~battle~~ action was ~~shot~~ struck by a ~~small ball~~ spent shot, which striking the Earth many yards in front of him, rebounded directly toward him- striking, ~~and~~ to use his own expression, struck the ball to fell on the small of his back. - at the instant of impact, ~~his~~ his body, ~~was~~ bearing his attitude of leaning over the breech of his gun, was in nearly an horizontal position.- The velocity of the ball, was low, and its course was ~~readily~~ distinctly visible to the Eye. The shock of the injury ~~the~~ received was momentary, severe, although not sufficient to ~~cause~~ prevent an officer as to cause Col. C. to leave the field until the ~~close~~ emergency ~~of~~ of the day's fight had passed. On examination, ~~several~~ hours after the infliction of the left lumbar region was found extensively, but considerable ~~discoloration~~, ~~extravasation~~ ecchymosis and discoloration was present- An abscess subsequently formed which was opened, when the patient ~~became~~ considerably relieved but continued further ~~suffering~~ treatment -

A Case of Somewhat ~~similar nature~~ other character, was observed by the author during ~~the last~~ ~~Grant's~~ the Wilderness battles of 1864, In this instance a ~~round~~ three inch spherical case ~~rebounded from~~ ricochetting, glanced from the flank of a horse, bruising and contusing at the same time the left leg of the rider, ~~an officer of cavalry~~ a staff officer, but in neither case ~~was~~ the integuments ~~were~~ destroying ~~penetrated~~ and ~~but~~ no solution

Severe contusions are also often caused by fragments of exploding shell. As an instance in point may be mentioned ~~the~~ a case Examined by the author, in which a 12 pound shell exploded close to an Artillery man, producing a severe contusion of the dorsal muscles of the thorax, and fracturing the ~~lumbar~~ portion of its crest -

Were it desirable, many more instances similar to ~~these~~ those cited, might be adduced, but the examples given are perhaps sufficient to illustrate a class of injuries ~~so frequently mistaken~~ which although comparatively trivial in character, are yet of frequent occurrence -

Elongated Shell & Case Shot

~~The destructive [illegible] projectiles of the Ordnance Field Guns may be generally~~ usefully ~~enumerated~~. The use of the Solid Elongated Ball for field purposes, has been generally dispensed with in the ~~British~~ Service, and in its place, the Shell, or case (the former .....) has been substituted. The ~~last mentioned~~ projectile ~~presents~~ all the penetrating ~~power~~ of the ~~gun~~ Solid Ball, with the added with the additional ~~power~~ Explosive Effects

(58) 2

The principle upon which the bursting of these projectiles are accomplished are precisely similar to those already described in the Mortar Shell & Case.

It should be here ~~mentioned~~ stated, that the Rifled ~~guns~~ Ordnance, & altogether Muzzle loading ~~guns~~ Breech Loading ~~guns~~, or the ~~former~~ ~~new~~ ~~guns~~ cannon never have been introduced into the Service. ~~The Ordnance~~ In the British Army on the contrary all ~~the~~ Ordnance with breech loading ~~guns~~ cannon, having proved unsatisfactory, ~~they~~ have not ~~as yet~~ been adopted by the Ordnance Department. In the British Service as the contrary, Rifled Cannon loading at the breech, & the accuracy & destructive ~~plans~~ have ~~been almost~~ met with much favor, & have been largely introduced.

The Fuze, & the Time of Shell & Case Shot

The ~~Ignition~~ Ignition of the bursting charge in Shell, is effected by means of a fuze. Fuzes are of ~~three~~ three ~~kinds~~ varieties, the ~~most generally used~~, the time ~~fuze~~, the Concussion fuze, & the percussion fuze. The time fuze, is ~~made of~~ filled with a case, generally of paper ~~with a composition of combustible materials~~ containing an inflammable substance, ~~which~~ arranged under such ~~is to be~~ ~~compressed in such~~ quantity, ~~that it will~~ as to burn a given number of seconds. The time is indicated on the ~~shell~~ fuze, by cutting off the case, when at the proper moment the Concussion & percussion fuzes do exactly correspond in their character. Another form of time fuze is the Bormann fuze, a metallic disc, which seems only to be a ~~modification~~ variation of the preceding, ~~in~~ the bursting charge is ~~fired~~ ignited with the inflammable material, & communicates an ~~ignition~~ impulse with the bursting charge. The upper surface is marked with ~~numbers~~ divisions corresponding to seconds of time. To use this fuze, if it be desired to explode the Shell, at 3 seconds distance from the gun, the Cannoneer before loading ~~pierces~~ punches the fuze at the ~~point~~ division 3, with a punch through the upper plate of the disc, thus opening a communication with the ~~charge~~ bursting charge for the ignition of the fuze by the discharge of the Piece, & on the ~~discharge of the gun~~ ~~piece~~, and causing the explosion of the Shell 3 seconds after the ~~ignition of the fuze~~ discharge of the piece, & ~~causing~~ the ~~burst~~ bursting of the Shell.

The ~~percussion fuze~~ & ~~concussion~~ fuzes, ~~are~~ are quite complicated in their ~~nature~~ construction, & ~~they act on the same principle~~ ~~[illegible]~~ and act by the ~~concussion~~ explosion of a detonating powder

The percussion & concussion fuzes are quite complicated - The consist of metallic tubes which lead into the Interior of the projectile - These tubes contain detonating powder, which is ~~fired~~ Exploded by the action of a metallic rod called a plunger, upon the impact of the projectile with a firm substance - ~~The~~ I consider all uncertain, & liable to accidents, the use of projectiles furnished with fuzes of this character - Many of them fail to explode at the proper time, & the failure has been known of frequent occurrence - ~~to be caused~~ resulting from accidental blows of the plunger upon the head of the tube, caused by handling, & ~~frequently~~ from the rebel Soldiers striking upon them with their muskets, after the battle has ended & passed away -

Fuzes, as they do not form a part of the shell, these metallic fuzes frequently reflect serious wounds, & the surgeon is often called upon to extract them from the body.

Grenades. The hand grenade is a species of shell, of small size, intended to be thrown by hand, ~~by the defenders of a work upon the assailants~~ - ~~Formerly these missiles were~~, and generally employed to repel ~~used in the defence~~ assaults upon fortified works. - The use of these missiles during the late war has been limited - During the assault upon the rebel fortifications - Formerly these missiles were furnished with simple time fuzes, which were ignited, at the moment ~~they were~~ the grenades ~~hurled upon assailants~~ were thrown - The hand grenade issued by the Ordnance Dept. of the U.S. army is arranged, on the percussion principle, so as to explode upon impact with a hard substance -

The use of these missiles during the late war, has been limited. At the assault upon the rebel fortifications at Fort Hudson on the Mississippi, an attempt was made by the U.S. forces to assail the enemy with Ketchum's hand grenade, which were thrown over the ramparts among the defenders of the work - But few instances of these grenades Exploded - Many of them were caught upon blankets by the rebel soldiers who in turn employed them against their assailants - The wounds produced by the explosion of these missiles are similar in every respect to those resulting from ordinary shells.

Occasionally at very close quarters, when defended ~~the assailed fort~~ works are assaulted, ~~the simple~~ ~~hooked~~ ~~fuses~~ wood shell with lighted time fuzes are rolled down among the ~~attacking troops~~ assailants. This is said to have occurred at the attack upon ~~when~~ the fortifications near Knoxville ~~were attacked~~ by the rebel column under Longstreet -

Theory of fire — In illustrating the flight of a projectile the three following lines must be borne in mind

First — The line of Sight, which is the visual ray, passing through the highest points, or sights of the breech & muzzle of the piece, and directed upon the Object fired at.

Second. The line of fire, is the prolongation of the axis of the piece, in the direction of the muzzle —

Third. The trajectory, which is the curve described by the centre of the projectile —

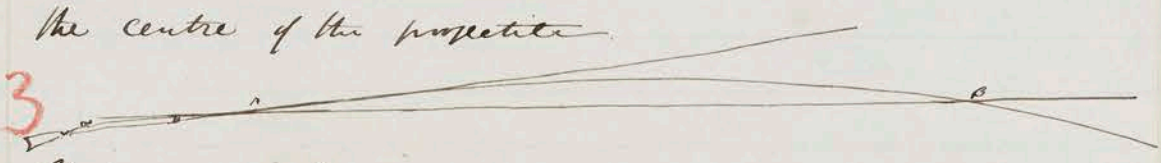


Fig 13

The Relation of the projectile to its trajectory, and it is a matter of much interest to the military Engineer, & well worth a moment's consideration.

Range, is the distance travelled by the ball before striking the ground — Extreme range is the distance at which the ball comes to rest.

Point-blank, is the point at which the line of sight, cuts the trajectory for the second time (B) — ~~Point blank range is the distance of this point from the gun; and in order to attain which the gun is directly aimed to strike an Object~~ Point Blank Range is the distance of the point from the piece — To strike an Object at point blank Range, the gun must be aimed directly at the Object — In the British Service ~~the term point blank has somewhat different signification~~ the term Point Blank Range is differently understood, means the distance traversed by a ball before striking the ground, when fired from a piece whose axis is horizontal to the horizon.

[1613½]

Velocity — The velocity of a projectile is the number of feet, ~~feet~~ which it passes over in any given second of time. Initial velocity ~~is~~ is the Space in feet, traversed by the projectile during the first second after it has emerged from the muzzle of the gun — the Space in feet passed over at any succeeding second is the remaining velocity — The velocity with which an Object is struck is known as its terminal velocity — The initial velocity of the round musket ball ~~under the same circumstances~~ is regulated ~~is~~ about 1400 feet, that of the rifle Musket, is about 960 ft — Owing however to the Equilateral of the axis of the cause the relative low displacement, & the absolute velocity of the elongated projectile Easily Exceeds that of the round bullet.

The resistance which is experienced by the Cylindro-conical ball in its flight through the air, is much less than that of the round bullet — This is due to the pointed form of

Owing to the pointed shape of the Cylindro-conical ball, the resistance, ~~effected~~ of the air in its flight is far less than that of a round bullet of the same

A ball when discharged from rifled arms has two forces or movements
impressed upon it, the one of translation, or projection, & the other
first, the movement of translation, or projection, & secondly
a movement of rotation, upon its axis — The latter, should correspond,
(that movement should correspond with the intersection of
At the moment the ball leaves the muzzle with the axis of the bore
of the piece — But this is not always the case — The rotation
ball for instance, fired from a smooth bored gun, whose
windage exists, & in which the ball bounces from
barrel — the direction of the rotation, will be governed by the last point
of contact with the barrel, and also by the position of its
of gravity of the ball, &c — If the latter or any defect
in the manufacture of the ball do not correspond with the centre of figure of
the ball, the rotation of the projectile will be irregular, in
proportion to the deviation between the two centres —

The irregularities incident to the flight & rotation of the round ball
fired from smooth arms, do not exist to the same extent, in the
flight of the elongated projectiles fired from the rifle musket —
But still they do exist, as can readily be known by an
examination of any considerable number of such projectiles
gathered on the field of battle, Many of which will
be found with distorted, or smashed & flattened bases, &
such appearances which can only be attributable to the projectile
having left the muzzle of the piece at an angle, & not
in the direction of the prolonged axis of the bore —

The Range of the U.S. Rifle Musket, may be considered practically
as about 700 Yards, which is the limit of distinct
vision — This arm will however kill, at much greater
distances from 1200 to 1500 Yards, & may thus occasionally
under peculiar circumstances be used against masses
of troops —

To 13

Calibre - Owing also to its increased weight, the Elongated ~~Projectile~~ ball retains its velocity longer than does the ~~the~~ Spherical bullet - It therefore happens, that, although the initial velocity of the former is less than that of the latter, ~~Yet after a short flight~~ shortly after leaving the muzzle of the piece the ~~absolute~~ velocity of the Elong.d ball is greater than that of the Spherical ball - The penetration ~~&~~ destructive power which it possesses, ~~consequent~~ upon its limited Velocity & rapid Rotation upon its axis, is also greater ~~than~~ that of the Round ball ~~x~~ Would then from a distant point of view, the destructive effect ~~of~~ when the former times of the Elongated ball, exceed in ~~gravity~~ those of any ~~missile~~, ~~as~~ modern or ancient discharged from Smooth ~~The~~ motion of such a ball in its flight is ~~a~~ object of ~~study~~ respect the curves - Position of trunnion line, initial motion, axis velocity, its ~~rotary~~ motion upon its long axis.

The relations of the Elongated bullet to its trajectory, is a matter of much interest to the military Surgeon; ~~It~~ ~~is~~ & Explaining many ~~to the~~ of the curious ~~phenomena~~ ~~observed by him~~ ~~and~~ ~~which~~ ~~are~~ ~~caused~~ by ~~gaps~~ ~~in the bullet~~ - The trajectory or curve line is the ~~varying~~ Curve in a vertical plane described by the center of the bullet in its flight - On the supposition that the ball ~~in~~ in its ~~flight~~ ~~pursues~~ ~~the~~ ~~curve~~ ~~exactly~~ ~~to the~~ ~~curve~~ ~~in~~ ~~which~~ ~~it~~ ~~is~~ ~~projected~~ ~~the~~ ~~curve~~ ~~to~~ ~~

Amer.

Br.

Majority of Americans elongated ~~bolt~~ ~~the~~ centre of ~~gravity~~ ~~of the~~ ~~bullet~~ is ~~to be~~ ~~behind~~ ~~the~~ ~~Centre~~ of the ~~bullet~~ ~~the~~ ~~bullet~~ ~~is~~ ~~to~~ assume in its flight ~~but~~ a position as is represented at fig.... ~~In the~~ ~~the~~ ~~bullet~~ a ~~to~~ ~~prospective~~ having ~~the~~ ~~centre~~ of gravity, ~~in~~ ~~the~~ ~~centre~~ ~~bullet~~ ~~could~~ ~~assume~~ ~~the~~ position as shown in fig.... ~~must~~ ~~thus~~ ~~consequently~~ The author has ~~assumed~~ ~~many~~ ~~words~~ ~~this~~ ~~position~~ It must also be ~~remembered~~ that this deviation ~~of the~~ ~~bullet~~, may be ~~increased~~ increased, by the ~~rapidity~~ ~~augmenting~~ ~~loss~~ ~~of~~ ~~velocity~~ ~~the bullet~~ ~~experiences~~ ~~in its axis~~ ~~by the~~ ~~of the~~ prospective change which ~~takes place~~ in the ~~velocity~~ rotation of the bullet, ~~towards~~ the termination of its flight. ~~If the reader will reflect~~ ~~The~~ ~~correctness~~ ~~of this~~ ~~can be best obtained by referring to~~ ~~for a moment upon~~ the circumstance attending the ~~flying~~ of a top. It will be remembered that the top when rotating at the highest velocity, stands upright ~~upon~~ in its ~~peg~~ in ~~the~~ ~~top~~ however, ~~it~~ ~~is~~ "asleep". As however its velocity of rotation diminishes, the motion is rendered unstable, & the top commences to ~~turn~~ describe a series of ~~gyrations~~, ~~turning thereby in a~~ describing thus a cone, the base of which is uppermost, ~~whilst~~ the apex formed is the point of the peg upon the ground. The base of this cone gradually increases in diameter, as the velocity of the top diminishes, & until the latter falls & comes to rest— how precisely the same thing occurs in the ~~revolving~~ elongated projectile, during the deceleration of its force. The ~~rotation~~ rotation upon its axis imparted to it by the rifles of the piece during the first part of its flight, gradually passing into a conical motion similar to that described as occurring in a top ~~coming~~ about to come to rest.

~~In~~ ~~In~~ It is important for the ~~Engineer~~ to bear these facts in mind, in ~~framing~~ ~~rules~~ framing rules to be ~~first~~ by the elongated projectile ~~in question~~. ~~As will be shown hereafter~~ The ~~theory~~ ~~party~~ ~~character~~ ~~nature~~ of the motion of the centre of gravity of the bullet as in the case of the ~~only~~ theory ~~to be~~ hereafter ~~explained~~ arrived at, ~~and the truth~~ ~~to the~~ Perhaps, ~~to~~ be ~~eliminated~~ from among the multitudinous opinions which have been advanced on this subject, will at ~~all events~~ ~~to the further~~ a ~~different~~ degree of study be ~~first~~ ~~opened~~ by ~~the~~ ~~after~~ after a careful study of the nature of the projectile themselves, ~~and~~ and of the disturbing forces which ~~influence~~ their flight. ~~and after the careful examination of the~~ ~~forces~~ ~~injuring~~, and the nature of their motion.

5

rapid rotation upon its axis imparted to it by the rifles of the piece during the first part of its flight, gradually passing into a conical motion, similar to that described as occurring in the ball about to come to rest.

Conclusion. It is ~~of importance~~ well for the Military Surgeon to bear these facts in mind, in examining wounds produced in battle by the Elongated Rifle projectiles. ~~In~~ the varying characters of the wounds produced by them, especially the wounds of entrance, can oftentimes only be fully understood upon careful study of the nature of the projectiles themselves, and of the disturbing forces which influence their flight.

b

1862

Appreciation of Value of Projectiles

Small Arm-projectile
- Round—
- Elongated.

For Musket rifled 700–800 yds.
" Carbines — 400 —
Proportions in miles —

Distances
200 yds. Eye part of a man's body, Uniform recognized—
500 " No face — but Head, body, arms, movements
600 " The Head, & upper & lower part of body can be made out —
700–800 " The body is Elongated
900 " files — But dust —
1100–1200 — no files but masses.

Infantry 1000 — 1200 cavalry yards

Common Shot — Round — with Extreme range — Ricochet
Elongated To a great distance, but act by Direct Hitting & Explosion — no ricochet
Cannister 200 to 500 — Guns not used.
Shell Less accurate than solid shot —
Demoralizing — Idea of proximity —

3/520/176.

4/1720/440.

Copie

Arming of the U.S. forces, during the War of the Rebellion

Nearly all of the Infantry first called into service in the Early part of 1861, of whom or the "three months men, were armed with the old Smooth bore musket of the pattern of 1822 (calibre .69) altered to percussion locks, or else with the Smooth bore-percussion musket of 1842.

A few Reg.ts Regiments from N.Y. & New England carried the new Springfield musket of 1855, These were obtained from the Quotas furnished to the respective States by the U.S. The infantry of the Regular Army were all provided with the improved Springfield Rifled Arm.

500.000 Levy

The 500.000 Levy was called for by act of Congress 4th July 1861 — To these troops 25.000 Springfield Rifle muskets, all that could be prepared during that year were issued — With these the few Regular troops in the Western armies were supplied — The rest were distributed to the troops of the Army of the Potomac.

The remainder of the Levy were furnished with Smooth bore Arms, of which 125,000 were of inferior foreign manufacture — (Here allude to Austrian & Belgian Guns)

Rifling

During the latter part of the year 1861, the Ord.ce Officials were busily employed in Grooving the Smooth bore Arms in store — As fast as this could be done, they were issued to the troops in lieu of the Smooth guns then in their hands. — The muskets thus altered, were of the Old patterns of 1822, & 1842, but when "Rifled", they were found to be

strong & serviceable weapons. The Chief Objection to them was their large calibre, .69 inch, demanding a ball of such weight as rendered it difficult for the foot soldier to carry a sufficient amount of ammunition. These altered muskets were subsequently called in, and their place was supplied by the Springfield rifle-musket, calibre .58 inch. As many of the English & Enfield rifles were still in use, with a calibre of .577 inch, an Elongated Ball of .577 inch suitable for all the rifle muskets in the service, was adopted by the Ordnance Dept; The Musketoon calibre was still further reduced towards the close of the War.

Fine-Sighting Long Range Rifles

During ~~a few~~ the war a few Regiments intended to act as Sharpshooters, were armed with fine sighting heavy target rifles, of long range. From these marksmen much was expected, but it is questionable, despite the Newspaper Correspondents, whether they at any time inflicted serious loss upon the Enemy, or realized the anticipations which had been formed as to their accuracy of fire.

Arms of the Cavalry Service

At the commencement of the war our mounted troops were armed, with Sabres, & Colts Revolving pistols of large size. ~~It~~ In addition they were subsequently furnished with breech-loading

Carbines of Sharp, Spencer & other patterns, as fast as they could be procured. — At a later period in the War and after the Organization of the Cavalry-bureau, this issue of arms was modified and it was ordered, that each cavalry-man should be armed with a Sabre and only one fire-arm, either the revolving pistol or Carbine —

Cavalry Arms

Repeating Rifles Carbines

The forms of the latter, which were most esteemed were the Spencer & Henry Repeating ~~rifles~~ carbines, for which Metallic water-proof cartridges were used —

The skillful Employment of such admirable long range weapons went far to contribute to the efficiency of the Cavalry, & indeed enabled this Arm of the Service for the first time in Military history, to dismount, meet, & repel the attack of an Enemy's infantry.

Artillery — At the outbreak of the war, the U.S. field Artillery was composed Entirely of Smooth bore guns — Rifled pieces had not been introduced; but very few indeed were in the Country, & they were in the hands of Experimenters, and of a few Companies of Militia Artillery — The absence of a rifled field artillery was regarded as a great deficiency, to remedy which vigorous measures were at once adopted —

Rifled Cannon became the Rage

Before many months, the Smooth bore guns were discarded, and in their place the

new pieces were substituted —

But the experience of one or two bloody actions showed, that the reform in this respect had been too sweeping —

Valuable as the rifled piece might be, the Smooth Gun was in its proper place not less so.

Field Artillery

The composition of the Artillery was accordingly revised, a proper proportion of Smooth bores, being redistributed —

The field Artillery as ~~xxx~~ constituted at the end of the war was composed of the Smooth 12 pounder, and the three-inch rifled gun, ~~xxx~~ either of the Parrott, or of the pattern of the Ordnance bureau. The rifled 10 & 30 pdrs. at one time in vogue were withdrawn from active field service —

It is unnecessary here to speak of Siege Guns, and heavy guns mounted in Forts or defensive Works. They are of every calibre from the rifled 10 pdr, to the mammoth Dahlgren, throwing a ~~xxx~~ projectile of several hundred pounds in weight.

Southern (Rebel) Troops — Arming of.

It is difficult of course to speak with accuracy on this subject. — It would appear however that the Southern troops were fairly armed in the earlier campaigns of the war — At this time either from good management upon the part of the Southern leaders, or by treachery towards the U.S. Government,

the U.S. Arsenals in the insurrectionary States were heavily stored with good government Arms.

These with the single Exception of those stored in the St. Louis Arsenals fell into confederate hands.

Importation of European Arms

Large numbers of improved Arms, and much Ammunition of European manufacture, were also brought over by the blockade-running vessels, and in the East, much material of war was captured in battle by the insurgents.

The ~~Southern~~ Confederate armies in the West were unquestionably well supplied with Arms, and Ammunition as early as March 1861. The Enfield rifle at that time had been obtained in large Quantities.

Very many of their troops were also armed with the Western or Mississippi rifle, a formidable weapon and one which in Expert hands carried havoc into the ranks of their Opponents.

At a later period, as the industrial resources of the South developed, public manufacturing Arsenals were instituted. In some of these, as for Example the Tredegar works, which contained the Gun machinery formerly in the U.S. Arsenal at Harpers-Ferry creditable and serviceable arms were turned out.

Projectiles

The Small arm projectiles used by the Confederate Infantry were of many types.

I have Mained from the different battle-field Specimens of the most prominent varieties of the English & Continental bullets.

Rebel Cavalry

At the commencement of the War, cavalry was a favorite branch of the service with the Confederates. The men, owning their own horses were well mounted. Their arms were the Sabre, & Revolver, and not infrequently, especially in the West, Each Mounted man carried also a Double barrel. Hunting-piece

Defensive Armor

No defensive Armor was ever authorized & permitted by the Government. But early in the War, attempts were made by a New England Company, to manufacture a Cuirass of soft steel, whose power of resisting bullets was greatly vaunted. One of these I Mained at Gettysburg, & it is now in the A. M. museum at Washington. It was taken from the body of a Confederate officer, & is pierced through & through in two places.

Mr Gallenes Gallery

Phenomena accompanying Ball Wound

Take case of Soldier stricken in action by a ball.

Sensations — May be unnoticed — or Told by friends or Comrades — or Observe blood on clothes

Nature of — compared to a dull blow, or to a Slight stinging Stroke as of Rattan or stick — Compared merely a sensation of being hit — call'd ill of limb by some to an Electric Shock, rather to that than Pain.

Influenced by — Appreciation of injury, influenced & lessened by Alarm, Pursuit, or Successful Action; or generally Favorable Circumstances

In Reverse case, that appreciation is increased, as in Defeat, Retreat, Despiriting circumstances, or where the Soldier lacks confidence. —

Pain — Sometimes referred to locality, sometimes to periphery, or limb. Occasionally present immediately after injury; or after the Soldier's recovery from immediate shock or commotion. Pain less when Ball at high Velocity as in injury of Nerves.

Secondary Pain — may come on a little later, say two or three hours after injury; & is dependent upon pressure on nerves, &c. tension produced by Extravasation, Swelling &c

The Seat of the Wound — can often at a glance be detected, or surmised, at least by the action or Attitude of those shot.

Thus in a general way, in Wounds of the

Lower Extremities, the Man will fall forward or Stumble, with an endeavour to break the fall of his body by his hands.

Upper Extremities — If Lower, will fall to side

Head — Most frequently pitches forward, or Springs, more or less Stunned. — Face, dazed

Trunk. — Here, in addition to Stinging, and Electric sensations, there are often a series of Involuntary Movements, the man turning partially or Entirely around.

In wounds

of the Chest — If shot in the chest, the action is often indicative of great anxiety produced by the Dyspnœa, & sense of Strangling, and also by the Moral Effect of the injury, which he regards instinctively, as so ~~xxxx~~ grave.

of the Belly — Here usually great Shock & Collapse, from impression produced upon great Sympathetic centres — The stricken man sinks down helplessly, ~~xxx~~ almost pulseless & lifeless

of Genital Organs — Wounds of these organs, especially of Testicle, are accompanied by Nausea, great demoralization, & occasionally intense pain — The patient writhes on the ground, doubling himself up.

Boy at Manchester on ground

of Nerves — In wounds of Nerves, or where the nerve trunks are affected by commotion, there is an immediate loss or impairment of Sensation & motion to a greater or less degree. — Occasionally there is very sharp

Pain. — Mitchell says in about $\frac{1}{3}$ of these cases

absent — the pain is absent —

referred to periphery. — Sometimes referred to periphery, as in injury of brachial plexus, where pain fell at arm & Elbow

referred to other limb — Sometimes referred to other limb (Mitchell)

9

Cannon Shot Wounds } In these often but little pain comparatively, in consequence of the stupor, general or local which accompanies so large an injury.
[Illustrate by Shell wound of Back. Belmont]

Race and Individuality } greatly affect the Soldier's behaviour when wounded. The
Re American (native born), as a rule regards his wound practically.
– It is an evil, an accident, but he will make the best of it.
– He will if not desperately hurt, get himself off the field
to succor as best he can, & as soon as he can. His
ingenuity soon converts a gunstock or a forked
stick into an impromptu crutch.

The Celt. is variable in his demonstrations. – Sometimes, gay
and light-hearted; Sometimes clamorous in his lamentations.
– [Irishman from Manassas, drunk, pipe in mouth,
with arm amputated just below Shoulder – Had walked 20 miles.]

The German, is phlegmatic – When wounded, he has fulfilled his part of the contract,
now the Government must do theirs, and care for him.

The Negro – Of all whom I have seen, the Negro when wounded
is the most patient, childlike, & trustful in his medical
attendant – Obedient to his commands
Speak of Negro detaining his arms – the white when
wounded, throwing them away as a rule –

P

Individuality of course exerts its influence — I do not think that men grievously wounded dead dealth as much as is usually supposed. ["How long can I live, once said a gallant officer on the other side who had lay dying & uncared for in the field all through the day? An hour or two I answered — "I am sorry for it, I would like to have lived longer, But Doctor, tell my father that I died as he loved me at the head of my men"]

Sir Philip Sydney at Zutphen.

Caste. The influence of rank, Military Caste, as it were, seems to me to be an Element in enabling men to face perils, and to bear up against & resist the depressing Effects of Injuries received in the line of duty.

Cowardice — To strong is the instinct of Self preservation, that prove many a man would be a coward in battle, especially in his first engagement, if it were not that he were afraid to be — if he did not fear to encounter the opprobrium & contempt of his Comrades comrades, and friends & family at home.

— The idea conveyed in the boastful speech that — "We Napiers cannot afford to be cowards" is not confined to a single family alone, illustrious as that may be.

Napiers

Lord Forbes's case

I have often seen wounded men, during hospitals bearing patiently & bravely sufferings heightened by privations, in the hope that by their Example, the fainting heart of others fellow sufferers a favorable influence might be exerted upon the fainting Spirits of their less resolute companions.

Religious Sentiment — I need not dwell here upon the resignation imparted to the sufferer, by the powerful Effects of religious consideration —

[Mention Case at Gettysburg, & Christian Commissioners]

5

Exaltation of Sentiment } ~~a fact~~ of a strange nature is often seen in those about to die ["The tree of liberty, is watered with my blood"] once said to me, an Officer, whose character & reputation, were not enviable, and whose ~~wound~~ fatal wound had ~~not perhaps~~ perhaps not been received under the most creditable circumstances.

Excitation or Excitement } often accompanies wounds, but generally I think those of comparatively slight nature — [Volatile man — Yelling ~~in battle~~ ~~wounds~~ This is a singular Effects of GSW wound,

Loquacity &c. — It manifests itself sometimes by Loquacity

Profanity

sometimes by an apparent affection for Singing,

a sort of desire to be thought heroic, & make a favorable impression.

This is so common, as not to require illustration —

Involuntary Rapid movements — Sometimes by these, as Running up & down — [Illustrate by Rebel Shot in thigh, running up & down, say 40 yards]

See also Col S. — Swords Wounded Indian p. 46

Noisy mania, Sometimes, [Illustrate by Volatile man, Yelling]

Cowardice Sometimes, [Illustrate by Boy at Alexandria]

That a man shot is not responsible, & should not be hastily judged for his cowardice is a well known fact to all Military Surgeons [Illustrate by S.W.M. case of Officer in Mexican War (Surg. Hist. p. 46.) wounded in heel, remains signs of great hesitation — & undoubted courage &c &c.]

[Illustrate also by Col. L.]

(Mark thro' ~~X~~)

Shock

6

Shock. — The most frequent symptom of injuries — the Earliest perhaps — and Ever before the Military Surgeon

Causes of Shock, complex and numerous, and the Theories as to Shock, misleading as they do the ~~the~~ Study of the action of the nervous system in all its Subdivisions are uncertain —

I do not propose to discuss these theories in detail, but rather to regard Shock from a Clinical point of view, as witnessed Early after the reception of G. Shot injuries

Definition of Shock — We all know what Shock, Surgically Speaking is — That it is a depressed condition of all the Animal functions, resulting from certain impressions made upon the nervous system; — either upon its central Organs, or upon its peripheral distribution —

The Causes of Shock — may be conveniently classified as has been done ~~have been classified~~ by Mr Jordan of Birmingham, in ~~the~~ his Hastings prize Essay "On Shock after Surgical Operations and Injuries" viz

1. Those ~~causes~~ which act upon the corporeal Organization ~~alone~~
2. " " " " " psychical "
3. " " " " both the corporeal & psychical in Equal or unequal Degrees
4. Cold

An Example of the 1st category, may be mentioned internal hemorrhage, as from the rupture of an internal aneurism

The 2d — The Psychical or emotional causes are familiar to you all — as grief, anger, fear

To the 3d Class (both corporeal & psychical), belong Gunshot Injuries

The Psychical element in this third class, as far as

(Read Carefully)

Mental Strain

far as Gunshot injuries are concerned, is Constituted by ~~the~~ Mental Strain, and apprehension, which a Condition of nervous tension which undoubtedly is experienced by all, even the most veteran Soldiers when about to Engage an enemy. This feeling may be one of anxiety or expectancy as to the result of the action; or it may be a feeling of fear or personal apprehension — In Each case, it is ~~a fact~~ an abnormal mental condition of Strain, naturally followed by depression; and a depression which will be all the more augmented should the Soldier receive a wound ~~a Wound be received~~ While in this Condition

It will thus be evident that in Military practice, the degree of Shock must be ~~the~~ Estimated by the nature of the injury; the man's mental condition; and also the Surrounding circumstances, as Exposure to Cold, or Internal Condition.

Divisions of Shock (clinically)

From a clinical point of View, of injuries ~~Cases~~ occurring in the field, I have been in the habit in my own mind ~~of dividing~~ Shock of dividing cases of Shock into two great Classes,

1. Those of Shock unaccompanied by Commotion of the Brain — Cerebral disturbance

2d. Shock, accompanied by Cerebral disturbance

And each of these great classes may be modified in its turn by the presence or absence of loss of blood

8

Let us for a few moments glance at these classes in detail and first of

Shock, unaccompanied by Commotion of the Brain.

This form of shock occurs most frequently in injuries of the extremities, and of parts remote from the great nervous centres —

As an illustration, let me take the case of a Gunshot fracture of the Hip joint, for a picture of this injury is vividly before me — As a rule this accident is usually attended by deep shock —

~~— I will suppose, as really happened, that~~
~~that but little hemorrhage exists.~~

We will suppose, as really happened, that there are but little hemorrhage. —
In such a case, seen immediately after the reception of the shot I have found the man upon his back, motionless, staring feebly upwards — He is almost void of muscular power.

Consciousness Exists to a degree — the man, hears you, & roused himself perhaps to your Questions, but as a rule the senses are obtunded.

The Voice is feeble, consisting rather of faint motions of the lips than of absolute articulate Sounds; but the effort to speak is often there.

Color. The color of the body is white, & the face is strikingly pallid — The lips are colorless, and from the absence of blood, appear thinned —
The fingers are white, and often purplish around the nails; a condition which has been ~~explained~~ ascribed to capillary venous engorgement, dependent on a reverse current from the veins, following upon marked contraction of the arterial capillaries.

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Temperature – The temperature of the body is low – The skin feels cold to the touch, and the patient complains of cold.

Face – at times the face is absolutely dull, and expressionless – at other times, its Expression is one of intense anxiety and fear –

With this latter condition, there is often the clammy sweat, and the forehead is bedewed with moisture

Eyes – The ~~the~~ Eyes are fixed, staring upwards with a glassy stare – most generally wide open – Sometimes slightly covered by the upper lids; Vision is often obscured.

Pulse – The pulse is feeble, sometimes scarcely to be felt – It is often slow, ~~and a fact~~ ~~heart beats~~ quickening as reaction approaches – It is often too irregular and ~~intermittent~~.

Respiration, is feeble, irregular & jerky.

From this condition the man may slowly react, – or else he may never rally, but may die in this state of shock; ~~to~~ as the common Expression the coldness and pallor increasing; the pulse and respiration gradually becoming weaker & weaker, and eventually ceasing –

But even in these cases of death from extreme shock, I have sometimes seen consciousness retained until a comparatively late period – especially I think when the shock has been the result of burns or injuries, affecting to a great degree the peripheral nerves distribution (Insert Note)

The form of Shock which I have decided is exceedingly common in Military practice—
—I have observed it after comminuted fractures of the large joints, by Elongated projectiles; and in crushes of the limbs from large missiles
—I have also seen it accompany the Amputation of an Entire limb from the Stroke of a Cannon shot.—

Frequency of first form of Shock.

It is often too, met with in burns and Explosions; and I am sure that Every Hospital Surgeon present can call to mind instances of death in a State of Shock, following burns, in which no cerebral commotion was present; the mind remaining clear to almost the last moment of life—

(Sect. IV

1. Shock unaccompanied by Commotion of Brain - Cerebral disturbance
2. " accompanied " " " " absence of loss of blood
3. Each in the two modifications by presence or absence of loss of blood

(Here I can Employ Small hand notes)

Shock, accompanied by Commotion of the Brain

This variety of Shock is most frequently met with in injuries proper to the head.— It is also observed in those cases in which the patient at the moment of the reception of an injury of an Extremity, or of the trunk, has at the same time suffered from concussion of the brain or Spine, from falling or from being dashed violently against the ground

Frequency

In such cases, the evidences of Shock as already described may be present, with the additional

phenomena dependent upon impairment of intelligence and loss of consciousness —

Hemorrhage as Element of Shock

I have thus far spoken of Shock produced by traumatic nervous impressions uncomplicated by great loss of blood; for such instances of Shock, I have repeatedly seen.

But as will be readily understood ~~Loss of~~ Hemorrhage exercises a most important influence upon the result of wounds received in battle, deepening as it does the Shock, and so ~~often~~ giving rise to a fatal Syncope

How Hemorrhage Acts

How Loss of Blood acts, whether primarily upon the Heart, by the withdrawal of its accustomed Stimulus, or primarily upon the Lungs, thus interfering with Blood oxidization, or primarily upon the ~~Heart~~ Brain & nervous System, thus secondarily deranging the Cardiac action, are matters for discussion

But let the explanation of the Dynamics of Hemorrhage be what it may, the results of Blood loss are constant & readily recognized by the Surgeon.

Convulsive Movements

There is one set of ~~Phenomena~~ Symptoms usually ascribed to Hemorrhage, to which perhaps I should allude — I refer to the presence of convulsive movements and tossings, and delirium, in those instances where the loss of blood has been ~~excessive~~ or prolonged — These phenomena are usually regarded as the precursors of death.

My own observation as to this matter is purely of a negative character.

I have frequently seen strong men in full health die, both from External & internal bleeding — Where the death has been sudden, as from rapid and violent Hemorrhage, I have witnessed no convulsion — I have thus seen a ~~the~~ shell wound of the Carotid, almost instantaneously fatal — So also I have seen death follow a ~~the~~ laceration of a large vessel in the pelvis, probably the external or primitive iliac — In neither of these cases was convulsion present —

Rapid loss of Blood

But where the bleeding has been gradual and prolonged, or recurring at short intervals, I have witnessed restlessness and jactitation developed to a degree which was almost convulsive in its nature

[Relate here case ~~at~~ before Petersburg]

Mental Shock

I have so far but merely referred to Shock dependent upon mental causes; but the existence of such Shock is well known to us all — One man is more impressible than another, And will suffer more depression from a his neighbor comparatively slight ~~cause~~, than will ~~another~~ from a grave injury

Thus I remember to have seen a young man of not more than 20 years of age, who had been brought off the field with a slight perforating flesh wound of the right thigh. — He was in a state of mental depression, which absolutely amounted to Shock, and influenced his pulse, his temperature, and his expression of face —

Example of — Effect of Mental Depression

His fears for himself were excessive, his state of mind was pitiable — Beside him lay a boy fellow with a ~~G.~~ Shot fracture of the upper 3rd of thigh, ~~bone~~ the ball having penetrated the pelvis and inflicted a fatal wound — He was in good spirits, brave & cheery —

Mental Effect on him

Those two had been wounded at the same time, had been exposed to the same transportation & had Equally well cared for — Yet one had suffered from traumatic Shock — The other had not — That the Shock of the former was Only mental

Mental was sufficiently proven by the fact that a few soothing assurances and a little stimulus dispelled his fears, brought color to his lips, and a pulse to his wrist

— I am sure that every Surgeon has seen many such cases of nervous excitability occurring in persons in whom it would be least suspected.

Sometimes this excitability is a natural predisposition constituting the nervous temperament — so called. — At it may perhaps be acquired as the result of Starvation, Exposure, Exhaustion, Malaria, or the depressing effect of disaster and defeat.

But when it does exist its influence upon the occurrence and degree of Shock is undoubted, and it affords a striking Example of the influence of the mind upon the body —

It will thus be seen that the State of Shock is of a compound nature, and due to complex Causes —

Practically as we meet with it in the field, these causes are combined & interwoven, so that it is difficult to recognize & at all Events to Separate them —

Fortunately the treatment is accommodatable —

Primary Hemorrhage

Primary Hemorrhage - General idea of "Bloody field"

Different Opinion among Surgeons as to frequency of Primary H.

Crimean War — Guthrie states proportion of Hemorrhage to wounds as 18:100.

" " — at Sebastopol, Pirogoff reports no case of primary ligation

Italian War — Stromeyer, speaks of the relative small proportion of Shot Hemorrhage;

" — Armée n 200 French cannot wound 20 of vessels

" — " " 200 Austrian round " 8 " "

" — Neudorfer, knew of no ligations primarily.

Ballingall — regards 75 p. c. of Battle field deaths, as from Hemorrhage

Circ: no: 6 p. 38 — Army of Potomac from Rapidan to James 36.508 wounded; 27 wounded of Arteries

Surg. Siddall (USV) Circ. no 6. p. 37 — Examined March 25 1865 at Fort Stedman before Petersburg 43 dead bodies

43 { Head - 23 / Chest - 15 / Abdomen 5 —

Those wounded in abdomen, Bodies all blanched, and all except 2 or 3 in chest also blanched

My own Experience as

1. Cannon (Round) Shot. - Hemorrhage is here exceedingly rare - Also from Elongated bullets

1. The limit is usually crushed, when the arteries may escape in virtue of their Elasticity -

2. The limit is torn off, when the vessels will be drawn out below point of all their contused, lacerated & clotted — Still beating Above

[Artillerymen at Fort Donelson]

Shell. — Fragments may cut vessel [Man at Shiloh, struck in Carotid Instant death - Sidney Smith]

Small arm Projectiles — Here vessels more apt to be cut than by Great Shot - Refer to incisive action of Elongated bullet - - Its high velocity - Its direct course —

But if a large vessel be cut

But if a large vessel be cut.

arterial walls retract

Effects of division of Artery

1st — The patient faints, & during this syncope, clots form in the vessel, & the hemorrhage is arrested spontaneously

E.g. Lung injuries.

or 2d. The patient dies almost instantaneously from the excessive loss of blood.

So that In reality

~~How the matter of~~

The surgeon has little to do with primary great bleeding; although undoubtedly, this occurs to a fatal extent frequently

Quote — My own Observations of dead, per in Burying trenches —

Nature of arterial Hemorrhage — welling out of deep wound - not always per saltum

Venous Hemorrhage — I am inclined to believe is more common than is supposed — judging from black clots in bodies,

Character of wound in arteries

often divided transversely — probably in this condition but little bleeding —

Often too I have seen a strip torn out of the vessel — so that bleeding must be mentally

Bleeding during Early transportation, classed as primary Hemorrhage incorrectly

Speak of the Matter of Hemorrhage on field.

Speak of impropriety of Tourniquets in most cases

Dr. Mott & Especially of Bandages —

[Relate story of Gettysburg Wisconsin Soldier]

Attitudes of Death in battle — He attracted but little attention. May be various — influenced by { Nature of missile / Time occupied in dying

Death from Exhaustion. or Gradual, slow, continuous Hemorrhage — Body usually rests upon one side, the Head pillowed on one arm, the limbs and lower part of trunk flexed.

Where Hemorrhage has been great, the body is waxy white, the face very pallid, but not livid — The Lips thin —

Death from Intense Shock, as tearing off of limb by Shot — Body mostly upon back, the face staring upwards, the arms dropped by the side.

Death from the discharge of a Cannon — Mostly occurs as an accident; from premature discharge, either of Salutes, or haste in action. Body seems to sink to the Earth, a ghastly heap —

Death, when Stricken by a Solid Shot or Ball — When the projectile is at full flight, the body is darted violently a considerable distance — Thus a man there may be thrown 15 or 20 feet —

Death from Causes interfering with Respiration — As wounds of Lung, inclining air passages, or wounds at root of Neck. — The body frequently rests prone upon its face & belly, the arms extended — the hands clenched grasping, the leaves, or sod, or dirt.

Death from Head wound — The body has usually pitched or sprung forward.

* Instantaneous death

*

Instantaneous Death

– It occasionally happens that the death occurring instantaneously, and directly on the receipt of an injury, especially of the head, the positions assumed by the body are most peculiar — the attitudes presented being those of the last moment of life —
Thus I have seen the

Body of a Soldier (on knees)

resting unsupported on the knees, grasping the barrel of a gun, the stock of which had dropped to the ground.

At Antietam (On one knee)

belonging to the Southern Army
At Antietam, I saw another Soldier of middle age, one of whose feet rested on the ground, and one knee against the bank of the road — the right hand stretched forward against the low breast-work of fence rails in front of him — for he had been killed instantly when rising to his feet, and leaning forwards, in defending the sunken road, close by that "famous field of corn" —

Both of the above men, had been shot through the head.

W. Reed Surg at Antietam

late Surg. U.S.V. at the same battle saw a boy of 17, a U.S. Soldier, who had been shot through the head — His right arm was raised, and his hand still held his Cap, with which he had been cheering on his Comrades, at the last moment of life — a peaceful smile was on his face —

Zouave at Williamsburg

– The same Surgeon, at Williamsburg, also observed the dead body of a Zouave, who had been shot directly through the forehead, as was climbing

over a low fence.— His toe, was the last attitude of life— One leg, half over the fence, the trunk crouched backward as it were— One hand was raised to the level of the forehead, its palmar surface turned forward, as if to ward off a coming foil.—

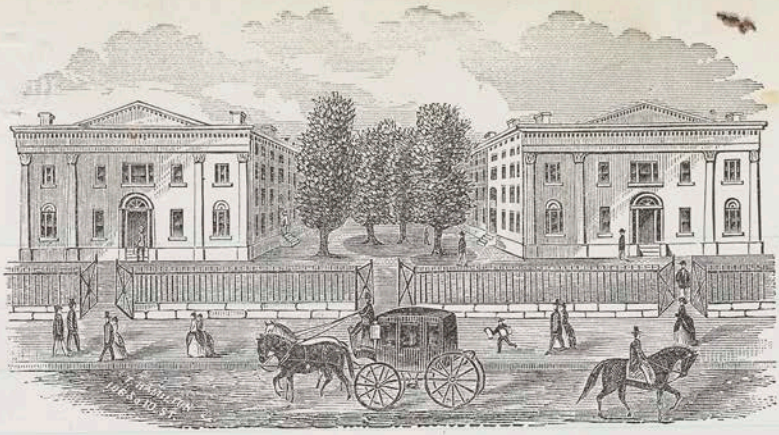
Red's Ironare at Wilmerding

I have frequently seen dead bodies of men who had fallen with their muskets in grasp, pointing forward & carried as if on an advance charge.

I have too more than once seen a body on its knees, under circumstances, when I had not time to dismount and Examine into particulars

Dr Brinton

Present



University of Pennsylvania,

Philadelphia, November 2d 1869

My Dear Sir

I am sorry to say that the incident of instantaneous death to which I alluded, cannot be substantiated by any evidence except my own recollection.

As nearly as I can recall the story, it was, that my brother Henry observed a brakesman on the cars between Nashville and Chattanooga, die from the effects of a gun shot wound between the eyes, and become rigid within five minutes afterwards.

He was shot while putting on the brakes, and after death, the

arms retained their position. The pipe which he had been smoking, remained clasped between his teeth. My brother at the time was sitting beside him on top of the car; and the shot was fired from the wood through which the train was passing.

Yours respectfully
Louis S. Stillé.

Dr. John H. Brinton

C. S. Wade

While a detail of Union soldiers were foraging in the vicinity of Goldsboro. N. C. they suddenly came upon a squad of Southern Rebel Cavalry dismounted. The "Rebs" immediately broke for their horses. A volley was fired at them apparently without effect as they all rode away, with one exception. and he was standing with one foot in the stirrup - one hand - the left - grasping the bridle rein, and mane of his horse - the right hand grasping his carbine near the muzzle, the butt resting on the ground - his head turned over his right shoulder seemingly watching the approach of his enemies. Some of the party were about to open a second volley. wished to give him the benefit of a second volley. (the first volley was fired at the distance of about two hundred (200) yards) but we was restrained by the officer in command - who but ordered upon the party to bring their arms to a "ready" & advance & take him alive - in the mean time the "Reb." had been called upon to surrender several times, to which he made no response. Upon a nearer approach and examination the soldier was found to be rigid in death, in this singular condition or attitude above described. The utmost difficulty was had in endeavoring to wrench his hands loose from the mane of his horse, and the carbine from his right hand - and after he was laid upon the ground his limbs retained the same position the same inflexibility. He had been struck by two balls - each from a Springfield rifle. One entering the right temple with no apparent exit - the other entering the body on the right side of the spine, coming out - as was supposed at the time - near the region of the heart - indenting the saddle skirt - had dropped upon the ground. The horse had remained quiet all the time apparently, & was fastened by a halter. There was no medical man present that I am aware of - so I can only give you the facts as I saw & understood them at the time.

P. S. J. N. Burtnett.

This took place in the spring of 1865. the Union Soldiers were a detachment of Sherman's army. the "Reb." belonged to the Rebel General Wade Hampton's command. so citizens informed us.

D. N. B.

20 ~~13~~

a dead Zouave, who had been shot directly thro' the forehead, as he was climbing over a low fence — The body remained in the last Attitude of life, one leg half on the fence, & the trunk curved back-ward as it were — The hand was raised to the level of the forehead, ~~that~~ the palm in front ~~direct aspect~~ forward, as if to ward off a coming Evil.

Dead Zouave

I have frequently seen, men the head bent ~~grasp thrown~~, who had fallen into their Attitude in Grasp, precisely forward & carried on the Attack. I saw in more than one case dead, the body a man after ~~bodies~~ in Place, where I had not time to examine particulars —

Woman's Case

To come after 19 & connected Large noted

Battery Horse at Ambleham

Their positions so peculiar not confined to Wounds alluded to Battery horse at Ambleham Shot thro' Head.

Since the Note on the preceding Case were collected I find in one of the Appended Papers to M. Chenu's Report of the Medical Service of the French Army in the Crimea, some observations by Surgeons Perrier & Armand of that Service on the same subject — These Gentlemen observed the dead of Alma, Inkerman, & Mackenzie, & found that a bent body existed in the last attitude of life — By them the ~~dying~~ muscles were grasped; some were in their Place in the attitude of defence, some with raised

21 14

head, as in the case described by Dr. Reed, as if it
were cut off a block. In one case, that of an Hungarian
Hussar, killed at the same moment as his horse, the body
fell on the right side almost on the saddle, the sabre point
carried forward ~~by~~ in the position of ~~the~~ a Charge of
Cavalry-man. —

In the majority of cases, reported as well
as in cases observed by myself & others, the fatal wound was in
the head, usually directly through the forehead —
I have rapidly taken a life, as easily as death, when it be-
came known to me that the same phenomena
~~of Epilepsy in fatal wounds~~ occurred
in two instances, when the ball had passed
through the heart, and on both cases it reported
by the French Officers attended to.

Boy or Male Belmont

I have spoken of this rapidly, as the result of ~~sudden~~
~~violent~~ death, wounds which must from their nature have
been instantaneously mortal — I should however state
here that I have known rapidly, a somewhat similar
~~the Convulsive Epileptic~~ to accompany death occurring some hours after
Reception of the wound — [Here include the Belmont
Case of Boy

Mr. McClellan's case Facial Expression in the Head

a Soldier of the American Army, was struck through the Head apparently in 1864 near Clinton La, during a guerilla fight. He was hastily removed, dying, into a Buggy with the body, & head as he was placed in his seat. The rode in the position he was then, at full speed, & rapid pace.

In death — great stress has been laid upon this
subject by Mr. Armand Report — It occasionally
so death does happen, that in sudden death, the last Expression
of life, Lingers through Rigor Mortis for a while on the face of the Corpse
— Dr. Reed positively denies the smile — I have sometimes
thought that I could fancy an Expression of Expectation,
sometimes of perception & related so — This I can say
I have observed more markedly in the Negro Soldier whose

22 & 5 Mem[illegible]

Stated this theory was a fixed, permanent, & ever present idea

Literature

In attempting to ~~test its~~ ~~truth by the literature~~ Can something of this very extraordinary & comparatively rare condition, I find that by what is read, — The same phenomena have occasionally been observed in deaths from asphyxia, One of the most remarkable of these is that reported by Dr. ~~Reckond~~ Marc of a man named Gordon, who was found dead with the body bent in such relative position that his head & heels, the weight of the body being supported by the feet & head. &c

Annales d'Hygiene Tome VII p. 375

Carpenter Physiology 333

Quote Carpenter p. 333

& also that of Mrs. Reid at Edinburgh June 1835 æt 56, found dead "in a sitting position in front of her bed, having her head erect & holding up her right arm & hand." "neck dislocated between the 1st & 2d vertebra, the Atlas & Dentata, & 2d vertebra fixed in the middle of the processus dentatus"

Mrs. Reid Case

Watson & Homicide (Hospl. Library) p. 1266

— In certain case, the unnatural position of the body was regarded as having immediately followed death — In the case of Mrs Reid, Surgeons seem to point to the fact that the probable murderer her husband had placed the body in the unnatural position, after death, & during rigidity

What is the rigidity?

Cadaveric rigidity commences at once.

— Interesting Question — Difficult to answer — It is not probably of the nature of Cadaveric rigidity, inasmuch as the latter does not commence until a certain time after death, say from 6 to 20 hours, whereas the rigidity in question is the accompaniment of death — Dr. Carpenter

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one of the Bronchi
in the Physiology regards this rigidity a contraction as secondary
of a tetanic character, which ceases after a few hours, &
is then succeeded by a state of flexibility, after which
the ordinary rigidity supervenes" —

Dr Carpenter's views

Without questioning the opinion, I would however briefly allude to
The cessation of this rigidity after a few hours as stated
by Dr Carpenter would seem to me to be a matter
of some question — Since I have myself witnessed it in
bodies which had been dead at least 24 hours, if
not more, — The Bodies Exhumed by M. Pieri
at the Alma, were ~~in the Trench~~ Jeers 48 Hrs:
after death & those Opened by M. Armand
at Magenta, 24 hours after death —

My own opinion

I regret not having had opportunity to examine this matter more fully at the
time, but exigencies of the battle field & demand all care
rather for the living than the dead —
But from a careful consideration of all that I have
been enabled to observe, I am inclined to
believe, that in all of these cases, the rigidity
of the rigidity has developed at the instant
of death
2. That the Cadaveric Attitudes exhibited are
those of the last moment of the life —
3. That Death, my patients, has been instantaneous, & unaccompanied
by Convulsions or Agony
4. That the rigidity is probably more lasting than is usually
supposed
5. — Whether a 2d Relaxation, followed by the ordinary Rigor
Mortis, does occur I cannot tell — I should think

The muscles have at times been surprised by death, and ~~have~~ especially the Upper Class, from a state of rapidity as to fix, the objects grasped in life

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Mummies will not bread either on living or dead human bones - Even when mightiest they left amid them - - Despite

Quote Thomas Campbell, & Lockhart warning
when the Wizard books but Evil to Clan
Cameron, at the coming Culloden
& Inspiteeis

"And their half beaten bosoms, are true to the plain"

Quote my own Observation at Belmont -
Human Experience
Cavalry major & Brigade in Tennessee.